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Soil Testing Equipment

AGRAR MEASURING SYSTEMS

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Soil meters
Gas and water analysis
Nutrient analysis
Climatic measuring systems

PRODUCT CATALOGUE 2014

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SOIL MEASUREMENTS

pH AGRAR 2000

3002

3011, for soil and water

3010, for water

For measuring pH in soil either directly in the field or in the lab

The pH AGRAR 2000 is an important tool for monitoring crop nourishment. Plants grow optimally when a pH value is maintained specifically for that specific plant type. The absorption of certain main nutrients can be hindered if the the pH value is either too high or too low. The technical manual delivered with your Stelzner product contains a detailed list of optimal plant-specific pH values.

The new microprocessor-controlled pH AGRAR 2000 is easy to handle and very precise. It also features a piercing electrode made from glass that is custom designed for agriculture. This makes it the perfect device for agricultural measurements. It features straight-forward pH4 and pH7 automatic calibration. The electrode conductivity slope is displayed (in mV/pH) on the device so that you can check the sensitivity of the pH electrode. An alert is displayed if the pH electrode sensitivity is too low. You can still take measurements when the sensitivity is reduced but you should replace the pH electrode with a new one as soon as possible. Our special pH piercing electrode made from glass features three ceramic diaphragms and a liquid electrolyte. The electrolyte prevents the diaphragms from becoming clogged up with soil. This increases the durability and lifespan of the entire unit. The base unit is enclosed in a sturdy housing that is built to withstand the most demanding requirements of field and lab use.

The pH AGRAR 2000 can be used for direct crop measurements or also for checking substrates, fertilizer solutions and even water quality.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 14
Resolution:	0.01
Precision:	±0.02
Display:	LCD display
Operating temperature:	+5 to +45 °C
Power supply:	One nine-volt battery, size 6LR61
Run time:	approx. 100 hours
Protection class:	IP40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	350 x 280 x 100 mm approx. 1.8 kg

Art. No.	
3003	**pH AGRAR 2000, base unit without electrode**
3002	**pH AGRAR 2000 complete with case** pH AGRAR 2000 with pH piercing electrode made from glass, pH4 and pH7 buffer solutions, KCl refill solution with filler syringe, $CaCl_2$ powder for analysing soil solutions, piercing pin, spray bottle with deionised water, technical manual
	ACCESSORIES
3010	Plastic pH electrode only for liquids, gel electrolyte
3011	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, fixed, 1 m cable
3033	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, without cable
3004	Cable for the pH piercing electrode
3028	Cap for pH electrodes
3012	pH 4.0 buffer solution 100 ml bottle
3013	pH 7.0 buffer solution 100 ml bottle
3014	pH 4.0 buffer solution 1000 ml bottle
3015	pH 7.0 buffer solution 1000 ml bottle
3026	Buffer tablets* for calibration solutions 5 tablets for pH 4
3027	Buffer tablets* for calibration solutions 5 tablets for pH 7
3016	Buffer tablets* for calibration solutions 2 x 5 tablets for pH 4 and pH 7
	* Dissolve 1 tablet in 100 ml distilled water
0504	Calcium chloride ($CaCl_2$) for soil analysis (approx. 11.1 g for 10 l solution 0.01 mole/l)
0505	Calcium chloride ($CaCl_2$) for soil analysis (approx. 100 g)
1004	Spray bottle with deionized water
3022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
3017	Dibble
2014	Beaker for measuring volume, 100 ml with cover
3019	One nine-volt battery, size 6LR61

SOIL MEASUREMENTS

pH 205

Precise measurements of pH and temperature for small sample volumes

The pH 205 is a handy insertable meter for measuring pH and temperature. It features automatic temperature compensation. This device is well suited when only small samples are available for measuring, such as for a small partition in a cultivation system. It can also be used to measure in solutions. The insertable probe tip is embedded in impact-resistant plastic. The tip is not sensitive to contamination (thanks to the hole diaphragm) and can be easily replaced. The device also features an illuminated display and buttons with acoustic feedback. Single, double or triple point calibration is possible. The calibration process automatically detects the end value.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14 Temperature: 0 to +60 °C
Resolution:	pH: 0.01 Temperature: 0.1 °C
Precision:	pH: ±0.02 Temperature: ±0.4 °C
Display:	two-character illuminated LCD display
Operating temperature:	During operations: 0 to +50 °C Storage: –20 to +70 °C
Power supply:	4 LR44 button-cell batteries
Run time:	approx. 80 hours
Protection class:	IP65
Dimensions and weight:	145 x 38 x 167 mm, 215 g
Dimensions and weight with case:	400 x 320 x 90 mm, 2.7 kg

Art. No.	
3100	**pH 205** Base unit with insertion probe, retention cap, belt/wall holder
3102	**pH 205 start set** One-hand meter with insertion probe for measuring pH and °C, retention cap, gel and calibration bottles, 250 ml pH 4 and pH 7, belt/wall holder and aluminium case
	ACCESSORIES
3101	Retention cap for pH 205 filled with KCl
3103	Spare probe for pH 205
3030	pH 4.0 buffer solution 250 ml bottle
3031	pH 7.0 buffer solution 250 ml bottle
3032	pH 10.0 buffer solution 250 ml bottle

pH MEASURING SYSTEMS CHAPTER 1

SOIL MEASUREMENTS

pH Soil tester

Sturdy tester for direct measurements in the field

The pH soil tester is the classic solution for taking simple pH measurements in natural soil. It comes with an integrated moisture control mechanism. The tester does not need a power supply. It is not suitable for taking measurements in liquids or peat substrata.

TECHNICAL SPECIFICATIONS:

Measurement range:	3 to 8
Precision:	±10 %
Display:	Multi-coloured scale
Dimensions and weight:	160 x 50 mm, 170 g

Art. No.	
3000	**Soil tester pH Meter** Soil tester, measuring sleeve, sand paper, manual with crop value table
	ACCESSORIES
3020	Measuring sleeve for soil samples, for the soil tester pH meter
3023	Sand paper

Hellige pH Meter

Simple pH soil testing

The Hellige pH meter is a simple indicator test. This complete kit with instructions includes:

a pH-measurement colour chart, a small spoon for taking soil samples and a drip bottle for 50 to 60 tests with the soil indicator.

Art. No.	
2999	**Hellige pH Meter**
	ACCESSORIES
2998	Indicator solution Refill solution, 100 ml bottle Sufficient for 100 to 120 tests

Indicators

Our non-bleeding pH indicator sticks are used for taking quick and easy pH measurements in soil solutions and water.

Measurement range:	pH: 0 to 14
Divisions:	0-1-2-3-4-5-6-7-8-9-10-11-12-13-14
Measurement range:	pH: 2 to 9
Divisions:	2.0-2.5-3.0-3.5-4.0-4.5-5.0-5.5-6.0 6.5-7.0-7.5-8.0-8.5-9.0
Multi-sticks for aquarium use:	Total hardness: 5° to 25° d Carbonate hardness: 3° to 20° d pH: 6.4 to 8.4

Art. No.	
2083	**Measurement range: 0 to 14 pH** (100 pcs.)
2084	**Measurement range: 2 to 9 pH** (100 pcs.)
2085	**Multi-sticks** (100 pcs.)

LIQUID MEASUREMENTS

pHep4

pH/T Pocket Tester

The pH/T pocket tester is designed for taking simple and speedy pH measurements in liquids and features automatic temperature compensation. The tester is housed in a waterproof enclosure and features a double display and battery-charge meter (so you can avoid taking bad measurements with a weak battery). The tester also enables electrodes to be swapped in seconds. Additional features include a stability indicator for reading measured values, automatic shut-off, automatic calibration (single or double point), and a HOLD function for freezing measured values.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14 Temperature: 0 to +60 °C
Resolution:	pH: 0,1 Temperature: 0.1 °C
Precision:	pH: ±0.1 Temperature: ±0.5 °C
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	4 x 1.5 Volt
Run time:	approx. 350 hours
Dimensions and weight:	163 x 40 x 26 mm, 85 g
Features:	water-proof

Art. No.	
3008	**pHep4**
	pH/T pocket tester with buffer solution pH 4 and 7, wrench
	ACCESSORIES
3009	Spare pH electrode for the pHep4/Combo
3005	pH 4.0 buffer solution 20 ml bag
3006	pH 7.0 buffer solution 20 ml bag

pH MEASURING SYSTEMS CHAPTER 1

LIQUID MEASUREMENTS

pH600

pH pocket tester

The pH600 is an inexpensive and pocket-sized pH tester. It takes quick and easy measurements in liquids and filtered soil solutions. It is suitable for use in horticulture, landscaping, aquariums, hydroponics, swimming pools, ponds and in the laboratory. It is calibrated manually to pH 7.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 14
Resolution:	0.1
Precision:	±0.2
Display:	LCD display
Operating temperature:	0 to +50 °C
Power supply:	4 x 1.5 Volt
Run time:	approx. 700 hours
Dimensions and weight:	150 x 30 x 24 mm, 85 g

Art. No.	
3007	**pH600**
	pH pocket tester with buffer solution and screwdriver
	ACCESSORIES
3006	pH 7.0 buffer solution 20 ml bag

MEASURING ACTIVITY DIRECTLY IN SOIL

PET 2000

Activity measurements and monitoring crop nourishment

The PET 2000 activity meter can measure the potential absorption of nutrient salts under the same conditions as the actual nutrient salt absorption through the roots. This means that the dissolved salt content is measured in the soil and substrata and thus corresponds to the direct "activity" within the plant canopy. The displayed units are g/l (e.g., grams of salt per litre of substratum). All related soil properties (such as fertilizer concentration, soil humidity, volume density and temperature) and taken into account for the measurement.

The accompanying technical manual can then be used to properly evaluate the measured salt content. In landscape architecture, tree schools, nursery gardens, public parks, forests and all other areas where plants are cultivated, this meter helps to verify and monitor your plan of action. You can optimize your cultivation results with the PET 2000.

When high salt content is being measured, the nitrate test strips (art. no 1100) can be used to differentiate between nitrogen and accompanying salts. The AM probe is available in a variety of lengths (25, 50 or 75 cm with 10-mm diameter) to fit the application. Longer probes are available on request. The AM probe is made from stainless steel and has a 3-cm measuring tip. The probe is maintenance-free. It come with a 9-Volt battery and a splash-water resistant enclosure.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Precision:	±0.02 g/l
Display:	LCD display
Operating temperature:	+5 to +45 °C
Power supply:	One 9-Volt battery, size 6LR61
Run time:	25 hours
Protection class:	IP40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	350 x 280 x 100 mm approx. 1.6 kg

Art. No.	
1000	**PET 2000 activity meter**
	Base unit without AM probe
1100	**Soil advisory kit, Type I**
	PET 2000 with AM probe (25 cm), nitrate test strips, 100 ml beaker, Spray bottle with deionised water, technical manual
	ACCESSORIES
1001	AM probe (75 cm)
1002	AM probe (50 cm)
1003	AM probe (25 cm)
2005	Nitrate test strips Box with 100 strips
8102	Nitrate (each bag with 6 test strips)
1004	Spray bottle with deionized water
2014	Beaker for measuring volume, 100 ml with cover
3019	One nine-volt battery, size 6LR61

SOIL ACTIVITY CHAPTER 2

MEASURING ACTIVITY DIRECTLY IN SOIL

PE controller

Straightforward monitoring of plant nourishment

The PE CONTROLLER is designed for simple on-site monitoring of plant nourishment. It can measure the potential absorption of nutrient salts under the same conditions as the nutrient salt absorption through the roots as the time of the measurement. This easy-to-use instrument can display on-site whether there is too little, too much, or the right amount of available fertilizer present.

The measurement is taken directly in the substratum, compost, garden soil, or greenhouse. This allows you to monitor the nutrient status potted plants, balcony boxes, container plants and vegetable beds. You can be sure that you're not using too much or too little nutrients with the PE CONTROLLER. This handy tool is a must for every hobby gardener. The probe is 25 cm long and has a diameter of 10 mm.

Art. No.	
1011	**PE controller with AM probe**
1012	**PE controller with case**
	PE controller with AM probe (25 cm), nitrate test strips, 100 ml beaker, Spray bottle with deionised water
	ACCESSORIES
2005	Nitrate test strips, Box with 100 strips
8102	Nitrate (each bag with 6 test strips)
1004	Spray bottle with deionized water
3019	One nine-volt battery, size 6LR61

EC 2000

Measuring conductivity in a solution

Electrical conductivity determines the electrical current between two points (electrodes) of different voltage potentials in a liquid. The conductivity increases as the amount of salt, acid or base contained in a solution increases. Conductivity is measured in units of mS/cm. The scale for water-based solutions starts with pure water (conductivity equals 0.05 µS/cm at 25 °C) and ends with a basic solution of 1.0 mS/cm (e.g., potassium solutions). Potable or surface water has a conductivity value in a range from 0.1 to 1.0 mS/cm.

Conductivity is measured using a measuring cell which consists (in the simplest case) of two similar electrodes. An AC voltage is applied to an electrode and this causes the ions in the solution to move in relation to the electrode. More current flows between the electrodes when more ions are contained in the solution. Using this measured current, the meter calculates the conductance of the solution and then, based on the cell specification, the actual conductivity value.

Areas of applications:
For horticulture, the conductivity value is also referred to as the EC value. The EC value is an indicator for the quantity of dissolved salts. It is specified in mS/cm.

The EC 2000 is used in all areas of cultivation and irrigation systems, including classic floriculture, substrata production and soil-free cultivation. It enables you to monitor basis solutions and nutrient solutions during fertilization. You can also check the salt content in substrata mixtures.

Please note: For the basis and nutrient salt solutions with high salt content, we recommend using the glass/platinum conductivity electrode instead of the carbon conductivity electrode. In solutions with high salt concentrations, the glass/platinum conductivity electrode has less polarization and thus provides improved linearity and more accurate readings.

The EC 2000 is a precise measuring instrument with temperature compensation that can be calibrated. It is used for quickly determining the mS/EC values in solutions from 0–20 mS/cm (with a carbon conductivity electrode) or 0–200 mS/cm (using a glass/platinum conductivity electrode).

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm with carbon electrode or 200 mS/cm with glass/platinum electrode Temperature: +5 to +45°C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1°C
Precision:	Conductivity: 0 to 20 mS/cm ±2 % 20 to 200 mS/cm ±5 % Temperature: ±0.2°C
Display:	LCD display
Operating temperature:	+5 to +45 °C
Power supply:	One nine-volt battery, size 6LR61
Protection class:	IP40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	350 x 280 x 100 mm approx. 1.6 kg

Art. No.	
4094	**EC 2000 conductivity meter**
	Base unit without electrode
4095	**EC 2000 Conductivity meter complete with case**
	EC 2000 with carbon conductivity electrode Calibration solution, 1.4 mS/cm and 12.88 mS/cm, Spray bottle with deionised water, beaker, technical manual
4095-P	**EC 2000 Conductivity meter complete with case**
	EC 2000 with glass conductivity electrode, Calibration solution 1.4 mS/cm, 12.88 mS/cm and 111.8 mS/cm, Spray bottle with deionised water, beaker, technical manual
	ACCESSORIES
4093	Carbon conductivity electrode
4195	Glass/platinum conductivity electrode
2014	Beaker for measuring volume, 100 ml with cover
1303	Calibration solution, 1.4 mS/cm 100 ml bottle
1308	Calibration solution, 12.88 mS/cm 100 ml bottle
1004	Spray bottle with deionized water
1304	Calibration solution, 111.8 mS/cm 100 ml bottle
3019	One nine-volt battery, size 6LR61

LIQUID MEASUREMENTS

DiST6

EC/TDS pocket tester

The EC/TDS Dist6 pocket tester enables you to monitor the conductivity (EC), TDS and temperature simultaneously. The EC, TDS and temperatures values can all be displayed at the same time.

TDS stands for total dissolved solids (i.e., the total amount of dissolved salts in a solution). The total amount of nutrient salts present in the irrigation water influences the capability of the roots to absorb nutrients. It also has a enduring effect on plant growth. For these reasons, it is important to check the TDS content regularly.

The TDS value is closely related to the conductivity value and is also an indication of water hardness. The EC/TDS pocket tester features a swappable probe, adjustable TDS factor, selectable temperature coefficient (ß), a battery-change display, a stability indicator, automatic shut-off, automatic temperature compensation, a water-proof housing and a HOLD function for freezing measured values.

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm TDS: 0 to 10 g/l Temperature: 0 to +60 °C
Resolution:	Conductivity: 0.01 mS/cm TDS: 0.01 g/l Temperature: 0.1 °C
Precision:	Conductivity: ±2 % of measuring range TDS: ±2 % of measuring range Temperature: ±0.5 °C
Display:	two-character LCD display
Operating temperature:	0 to 50 °C
Power supply:	4 x 1.5 Volt
Run time:	100 hours
Dimensions and weight:	163 x 40 x 26 mm, 85 g
Features:	EC/TDS selectable from 0.45 to 1.00 Temperature coefficient ß selectable 0.0 to 2.4 %/°C waterproof

Art. No.	
4105	**Dist6**
	EC/TDS pocket tester with calibration solution
	ACCESSORIES
1305	Calibration solution, 12.88 mS/cm 20 ml bag

CONDUCTIVITY CHAPTER 3

LIQUID MEASUREMENTS

CD611

EC pocket tester

The CD611 is an inexpensive and pocket-sized EC tester. It takes quick and easy measurements in liquids and filtered soil solutions. It is suitable for use in horticulture, landscaping, aquariums, hydroponics, swimming pools, ponds and in the laboratory.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 20 mS/cm
Resolution:	0.01 mS/cm
Precision:	±5 % of measuring range
Display:	LCD display
Operating temperature:	+5 to +50 °C
Power supply:	4 x 1.5 Volt
Run time:	approx. 350 hours
Dimensions and weight:	163 x 40 x 26 mm, 85 g

Art. No.	
4092	**CD611**
	EC pocket tester with calibration solution and screwdriver
	ACCESSORIES
1306	Calibration solution, 1.4 mS/cm 20 ml bottle

MEASURING SOIL AND LIQUIDS

MULTI 2000

The type-IX advisory kit for measuring pH, activity, conductivity and temperature

The new Multi 2000 integrates all the measuring possibilities of several meters into one instrument: It can take direct measurements of salt content, conductivity, temperature and pH value.

The activity of soils and substrata can also be determined with the Multi 2000 meter.
This activity corresponds to the dissolved total salt content (in grams of salt per litre). The meter measures directly in the plant canopy, the soil, or substratum (i.e., directly at the roots). This gives insight into the potential absorption of nutrient salts by plants while taking all soil characteristics into consideration (such as temperature, moisture and density). The scheduling of fertilization is simplified when periodic activity measurements are carried out. During crop development, you can monitor different soil layers for nutrient availability, long-term fertilizer attributes and deployed fertilizer concentration. The electrical conductivity in a solution can be measured by switching into EC mode and attaching the corresponding temperature-compensated conductivity electrode. You can make a targeted calculation of your fertilizer use by factoring in the EC value of the water you are using. This is the basis for all crop processes that use irrigation-based fertilization, including surface fertilization, dam irrigation, drip irrigation, and also particularly for soil-free crops.

The new microprocessor-controlled Multi 2000 is also useful for providing a quick and reliable check of the pH value. You can use this meter to check the conductive slope (and functionality) of a pH electrode.

The pH glass piercing electrode comes with several diaphragms. Thus it is possible to measure in solutions, substrata, natural soils or mineral wool.

A new feature here is the ability to measure the temperature in the field. The temperature is measured in the same place that the pH, activity and conductivity are being monitored (e.g., in the fertilizer solution or in the different potting depths). The temperature probes can be used either in solutions or in substrata. The technical manual includes instructions, guideline tables, usage tips, and the EC values of typical fertilizers.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14 Activity: 0 to 2 g/l Conductivity: 0 to 200 mS/cm
Resolution:	pH: 0.01 Activity: 0.01 g/l Conductivity: 0.01 mS/cm
Precision:	pH: ±0.02 Activity: ±0.2 g/l Conductivity: ±2 % 0 to10 mS/cm ±5% 10 to 200 mS/cm
Display:	LC display
Operating temperature:	+5 to +45 °C
Power supply:	One nine-volt battery, size 6LR61
Protection class:	IP40
Dimensions and weight:	180 x 65 mm / 80 x 40/50 mm, 280 g

Art. No.	
1201	**Multi 2000**
	Base unit without electrode
1200	**Advisory kit, type IX**
	MULTI 2000 with pH glass insertion electrode, AM probe (25 cm) with DIN-plug, 4-wire carbon conductivity electrode, pH 4, pH 7, 1,4 mS/cm, 12,88 mS/cm and 111,8 mS/cm solutions, KCl refill solution, $CaCl_2$ powder for analysis of soil solutions, piercing pin, nitrate test strips, beaker, spray bottle with deionised water
1300-M	**Soil advisory kit, type III**
	(features are corresponding with PET 2000 KOMBI) MULTI 2000 with AM probe (25 cm) with DIN-plug, 4-wire carbon conductivity electrode, 1,4 mS/cm, 12,88 mS/cm and 111,8 mS/cm solutions, nitrate test strips, beaker, spray bottle with deionised water, technical manual
	ACCESSORIES
4097	4-wire carbon conductivity electrode
3011	pH piercing electrode made of glass with 3 diaphragms, 3 mole/l KCl, fixed, 1 m cable
3033	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, without cable
3004	Cable for the pH piercing electrode
3012	pH 4.0 buffer solution 100 ml bottle
3013	pH 7.0 buffer solution 100 ml bottle
0504	Calcium chloride ($CaCl_2$) for soil analysis (approx. 11.1 g for 10 l solution 0.01 mole/l)
0505	Calcium chloride ($CaCl_2$) for soil analysis (approx. 100 g)
3022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
3017	Dibble
3028	Cap for pH electrodes
1023	AM probe (25 cm) with DIN-plug
2005	Nitrate test strips Box with 100 strips
8102	Nitrate (each bag with 6 test strips)
1303	Calibration solution, 1.4 mS/cm 100 ml bottle
1308	Calibration solution, 12.88 mS/cm 100 ml bottle
1304	Calibration solution, 111.8 mS/cm 100 ml bottle
2014	Beaker for measuring volume, 100 ml with cover
1004	Spray bottle with deionized water
3019	One nine-volt battery, size 6LR61
4444	Technical manual

MULTI ISE

The MULTI ISE: for measuring individual nitrate, ammonium and potassium components

Often it is helpful to know the precise nutrient components contained in the soil – especially nitrogen in the form of ammonium ions and nitrate ions. Such measurements can be a helpful supplement to the measurement of the sum of the soil's non-combined salts by means of an activity measurement or liquid conductivity with the Multi 2000.

The new MULTI ISE can directly measure the individual ammonium (NH_4^+), nitrate (NO_3^-) and potassium (K^+) ions using ion-selective single-rod electrodes.

Measurements can be made in fertilizer solutions, soil solutions (extracts), plants and organic material.

Individual ions can be measured directly within a fertilizer solution. A simply slurry solution made with deionized water (or better yet, an extraction solution recommended by LUFA) will suffice to determine the ion concentrations in substrata and soils. An extraction solution consisting of alum KAl $(SO_4)_2$ is used for ammonium. For potassium and nitrate, an extraction solution of calcium chloride ($CaCl_2$) is used (source: Methods of Agricultural Investigation and Research Institutes, LUFA). The necessary substances and instructions for making the extraction solutions are included with this kit. Prepared extraction solutions can also be provided.

No filtration or clarification of the measured solution is required. Turbidity or discolouration do not affect the measurement results!

The kit can be used to measure concentrations ranging from 1 mg/l to more than 1,000 mg/l – so there is no need to dilute the sampled solution.

The result is shown on the display in g/l with an accuracy of 0.001 g/l (1 mg/l). These concentrations can be determined with a precision level of ± 5 %.

The MULTI ISE is microprocessor-controlled and easy to use. The single-rod electrode (corresponding to ammonium, nitrate or potassium) is first connected to the instrument and then immersed in the solution being measured. The instrument references the on-board calibration data corresponding to that measurement.

The menu-driven calibration process is self-explanatory. The required calibration solutions and the technical manual are included in the kit.

The enclosure is waterproof (resistant to splashed water).

TECHNICAL SPECIFICATIONS:

Measurement range:	NH_4^+: 0 – 1,000 mg/l K^+: 0 – 1,000 mg/l NO_3^-: 0 – 1,000 mg/l
Accuracy:	1 mg/l
Precision:	±5 %
Display:	LCD
Operating temperature:	During operations: +5 to +45 °C
Power supply:	One nine-volt battery, size 6LR61
Service life:	Approx. 100 hours
Protection degree:	IP40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	350 x 280 x 100 mm approx. 1.8 kg

Art. No.	
1901	**MULTI ISE**
	Base unit without electrode
1900	**MULTI ISE Advisory Kit**
	MULTI ISE contains: electrodes for ammonium, potassium and nitrate; calibration solution; refill solution for electrodes with filler syringe; conditioning solutions; powder for extraction solutions; spray bottle with deionized water; user manual
	ACCESSORIES
1902	Ammonium single-rod electrode
1903	Potassium single-rod electrode
2017	Nitrate single-rod electrode
1904	Calibration solution 180 mg/l NH_4^+, 100 ml bottle
1905	Calibration solution 18 mg/l NH_4^+, 100 ml bottle
1906	Mixed calibration solution 390 mg/l K^+ and 620 mg/l NO_3^-, 100 ml bottle
1907	Mixed calibration solution 39 mg/l K^+ and 62 mg/l NO_3^-, 100 ml bottle
2027	Refill solution with filler syringe for electrodes, 0.1 mole/l KCl, 100 ml bottle
1908	Conditioning solution for NH_4^+ (1 mole/l NH_4Cl), 100 ml bottle
2024	Conditioning solution for K^+ and NO_3^- (1 mole/l KNO_3), 100 ml bottle
0504	CaCl2 powder for 10 l extraction solution, for NH_4^+, and K^+, 11 g
2035	Alum powder for 5 l extraction solution, for NO_3^-, 50 g
1004	Spray bottle with deionized water
3019	One nine-volt battery, size 6LR61

LIQUID MEASUREMENTS

7030 ion meter

Multi-channel meter for measuring pH, O_2, conductivity, redox and temperature

The IONOMETER 7030 can simultaneously measure the pH, the redox value, the conductivity, the dissolved oxygen and the temperature of water-based liquids. It is a microprocessor-controlled hand-held meter with a temperature compensation feature. The oxygen channel is also equipped with an air pressure sensor for adjusting the measured values. The display is capable of simultaneously showing all parameters as well as the temperature and pressure of the medium. The calibration process is semi-automatic. The meter also features timer-controlled recording of measurements and an RS232 interface for transmitting data to a PC (for analysis with the optional software). It can be powered either with a rechargeable battery or with a mains power cord.

TECHNICAL SPECIFICATIONS:

Measurement range:	pH: 0 to 14 Conductivity: 0 to 20 mS/cm Redox: –900 to +900 mV rH value: 0 to 42 Temperature: 0 to +50 °C Air pressure: 800 to 1,200 hPa O_2-content: 0.1 to 30 mg/l; 0 to 200 % saturation
Resolution:	pH: 0.01 Conductivity: 0.01 mS/cm Redox: 1 mV rH value: 1 Temperature: 0.1 °C Air pressure: 1 hPa O_2-content: 0.1 mg/l; 1 % saturation
Precision:	pH: 0.01 Conductivity: 0 to 5 mS/cm ±1 % 5 to 20 mS/cm ±5 % Redox: 1 mV Temperature: ±0.2 °C O_2-content: ±0.1 mg/l; ±5 % saturation
Display:	LCD points matrix (4 x 20 characters)
Operating temperature:	Operational: 0 to +50 °C Storage: –10 to +50 °C
Power supply:	external power supply unit, Rechargeable battery with integrated charging circuitry
Run time:	> 4 hours
Protection class:	IP40
Dimensions and weight:	225 x 105 x 48 mm, approx. 500 g
Dimensions and weight with case:	380 x 310 x 100 mm approx. 2.5 kg

Art. No.	
7030	**7030 ion meter, complete with case**
	Base unit with multi-sensor for redox, conductivity and temperature. Incl. integrated plastic pH electrode, oxygen sensor, power supply adapter, solutions (pH 4, pH 10, 2,77 mS/cm, 220 mV, 468 mV), salt for zero-solution oxygen, calibration vessel for 102 % O_2, beaker, oxygen refill solution, replacement oxygen caps
	ACCESSORIES
3061	Plastic pH electrode for ion meter only for liquids, gel electrolyte, custom plug
3064	iVM-H, PC data analysis software
3012	pH 4.0 buffer solution 100 ml bottle
3021	pH 10.0 buffer solution 100 ml bottle
1307	Calibration solution, 2.77 mS/cm 100 ml bottle
4046	Refill electrolyte for oxygen electrode, 25 ml
4047	Salt for zero-solution oxygen, 50 g
4048	Three spare membrane caps for oxygen electrodes
1310	Redox buffer, 220 mV 100 ml bottle
1311	Redox buffer, 468 mV 100 ml bottle

MULTI-TASK MEASURING INSTRUMENTS CHAPTER 4

LIQUID MEASUREMENTS

Combo

The pocket tester for pH, conductivity and temperature

The Combo pocket tester can take simple and speedy measurements of all key parameters, including the pH, the conductivity (EC or TDS) and the temperature. Temperature compensation is carried out automatically for the pH and EC/TDS measurements. The user can specify the EC/TDS factor between 0.45 and 1.00. The temperature coefficient (ß) can be set in a range from 0.0 to 2.4% per degree Celsius. The HOLD function can be used to keep a measured value on the display. The Combo is housed in a water-proof enclosure and features a large double display. The pH electrode can be swapped out by the user. The EC/TDS probe is very resistant to salt and other aggressive sample mediums.

TDS (total dissolved solids) indicates the sum of the dissolved salts present in a solution. The TDS value is closely related to the conductivity value. The total amount of nutrient salts present in the irrigation water influences the capability of the roots to absorb nutrients. It also has an enduring effect on plant growth. For these reasons, it is important to check the TDS content regularly.

TECHNICAL SPECIFICATIONS:

Measurement range:	Conductivity: 0 to 20 mS/cm TDS: 0 to 10 ppt (g/L) pH: 0 to 14 Temperature: 0 to +60 °C
Resolution:	Conductivity: 0.01 mS/cm TDS: 0.01 ppt pH: 0.01 Temperature: 0.1 °C
Precision:	Conductivity, TDS: ±2% of measurement range pH: ±0.05 Temperature: ±0,5
Display:	Two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	4 x 1.5 Volt
Run time:	approx. 100 hours
Dimensions and weight:	63 x 40 x 26 mm, approx. 85 g
Features:	EC/TDS selectable 0.45 to 1.00 Selectable temperature coefficient ß 0.0 to 2.4 %/°C waterproof

Art. No.	
3900	**Combo**
	pH/EC/T pocket tester with pH 4, pH 7 and 12.88 mS/cm solutions
	ACCESSORIES
3005	pH 4.0 buffer solution 20 ml bag
3006	pH 7.0 buffer solution 20 ml bag
1305	Calibration solution, 12.88 mS/cm 20 ml bag
3009	Spare pH electrode for the pHep4/ Combo

Type-X advisory kit

For measuring activity, pH and conductivity

The Type-X combination kit consists of three instruments: the PET 2000 for measuring soil activity (in g salt/l); the pH AGRAR 2000 for measuring soil or liquid pH values; and the EC 2000 for measuring the conductivity in liquids.

The PET 2000 allows you to determine the activity or total salt content (in grams of salt per litre) in the soil or substratum. The activity is determined by the amount of dissolved salts contained in the soil. The mobility of the salts is dependent on the humidity, temperature and density of the soil. This allows nutrient salts that are available to plants (such as nitrate or potassium) to be fully measured. This provides you with a concise overview of what nutrient salts are available to plants in the root zone.

The pH AGRAR 2000 is also included for monitoring the pH value. This microprocessor-controlled meter enables you to make quick and precise measurements in solutions such as irrigation water and fertilizer solutions. A glass pH piercing electrode allows you to determine the pH level directly in the soil or substratum. The meter comes with automatic calibration. It displays the electrode conductivity slope for monitoring the glass pH piercing electrode. A warning tone is emitted if the sensitivity level is too low. The sturdy housing is built for the rough conditions of agricultural field work.

The EC 2000 conductivity meter completes this instrument kit. EC value analysis is a critical component in fertilization, soil-free cultivation, closed cultivation, hydroponics, or salt-sensitive crops.

With its ability to measure up to 200 mS/cm, the EC 2000 is also suitable for monitoring basis solutions. It is temperature compensated and equipped with a specific conductivity electrode with integrated temperature probe.

TECHNICAL SPECIFICATIONS:

	pH AGRAR 2000
Measurement range:	0 to 14
Resolution:	0.01
Precision:	±0.02
	EC 2000
Measurement range:	Conductivity: 0 to 20 or 200 mS/cm Temperature: +5 to +45°C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1°C
Precision:	Conductivity: 0 to 20 mS/cm ±2 % 20 to 200 mS/cm ±5 % Temperature: ±0.2°C
	PET 2000
Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Precision:	±0.02 g/l
	Type-X advisory kit
Dimensions and weight with case:	450 x 350 x 110 mm 4.2 kg

Art. No.	
1010	**Type-X advisory kit**
	pH AGRAR 2000 with pH piercing electrode made from glass, pH4 and pH7 buffer solutions, KCl refill solution with filler syringe, $CaCl_2$ powder for analysing soil solutions, piercing pin, spray bottle with deionised water, PET 2000 with AM probe (25 cm), nitrate test strips, EC 2000 with carbon conductivity electrode, 1.4 mS/cm and 12.88 mS/cm calibration solutions, technical manual
1010-P	**Type-X advisory kit**
	Similar to the 1010, but with glass/platinum conductivity electrode for up to 200 mS/cm
	ACCESSORIES
3011	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, fixed, 1 m cable
3033	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, without cable
3004	Cable for the pH piercing electrode
3012	pH 4.0 buffer solution, 100 ml bottle
3013	pH 7.0 buffer solution, 100 ml bottle
1004	Spray bottle with deionized water
3022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
3017	Dibble
1003	AM probe (25 cm)
2005	Nitrate test strips Box with 100 strips
8102	Nitrate (each bag with 6 test strips)
4093	Carbon conductivity electrode
4195	Glass/platinum conductivity electrode
1303	Calibration solution, 1.4 mS/cm 100 ml bottle
1308	Calibration solution, 12.88 mS/cm 100 ml bottle
1304	Calibration solution, 111.8 mS/cm 100 ml bottle
2014	Beaker for measuring volume, 100 ml with cover
4444	Technical manual
3019	One spare nine-volt battery, size 6LR61

Type-V advisory kit

Measuring activity and pH

The Type-X combination kit consists of two instruments: the PET 2000 for measuring soil activity (in g salt/l) and the pH AGRAR 2000 for measuring soil or liquid pH values.

The PET 2000 is used for the quick and reliable monitoring of plant nutrients in soils or substrata. It measures the plant's root zone for potential nutrient salt absorption. You can determine immediately whether the total salt content in the root zone is too high, too low or just right. The PET 2000 has a 25-cm AM probe. 50-cm or 75-cm probes are also available (refer to page 7). The device is maintenance-free.

The pH AGRAR 2000 allows you to monitor the pH level with reliability. The glass pH piercing electrode allows you to determine the pH in substrata, soil (in the root zone), in fertilization solutions or in irrigation water.

The pH AGRAR 2000 features automatic pH calibration. It also displays the electrode conductivity slope so you can monitor the pH electrode.

The Type-V combination kit is the perfect companion while working in production facilities, landscaping consulting, earthworks, garden centres, tree care or vegetable crops. All of the kit's instruments are microprocessor-controlled and highly accurate. They are easy to use and custom designed for agricultural applications.

TECHNICAL SPECIFICATIONS:

	pH AGRAR 2000
Measurement range:	0 to 14
Resolution:	0.01
Precision:	±0.02
	PET 2000
Measurement range:	0 to 2 g/l
Resolution:	0.01 g/l
Precision:	±0.02 g/l
	Type-V advisory kit
Dimensions and weight with case:	350 x 450 x 110 mm approx. 3.5 kg

Art. No.	
1500	**Soil advisory kit, Type V**
	pH AGRAR 2000 with pH piercing electrode made from glass, pH4 and pH7 buffer solutions, KCl refill solution with filler syringe, $CaCl_2$ powder for analysing soil solutions, piercing pin, spray bottle with deionised water, PET 2000 with AM probe (25 cm), nitrate test strips, technical manual
	ACCESSORIES
3011	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, fixed, 1 m cable
3033	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, without cable
3004	Cable for the pH piercing electrode
3012	pH 4.0 buffer solution, 100 ml bottle
3013	pH 7.0 buffer solution, 100 ml bottle
1004	Spray bottle with deionized water
3022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
3017	Dibble
1003	AM probe (25 cm)
2005	Nitrate test strips Box with 100 strips
8102	Nitrate (each bag with 6 test strips)
2014	Beaker for measuring volume, 100 ml with cover
4444	Technical manual
3019	One spare 9-Volt battery, size 6LR61

Type-VII advisory kit

For measuring pH and conductivity

The Type-VII combination kit consists of two instruments: the ph AGRAR 2000 for measuring pH in soil and liquids and the EC 2000 for measuring conductivity in liquids.

These two instruments are your ideal companions when monitoring the fertilization of hydroponic crops. The pH AGRAR 2000 allows you to monitor the pH. This microprocessor-controlled meter enables you to make quick and precise measurements in solutions such as irrigation water and fertilizer solutions. A glass pH piercing electrode allows you to determine the pH level directly in the soil or substratum. The meter comes with automatic calibration.

It displays the electrode conductivity slope for monitoring the glass pH piercing electrode. A warning tone is emitted if the sensitivity level is too low. The sturdy housing is built for the rough conditions of agricultural field work. The EC 2000 is used to measure conductivity. EC value analysis is a critical component in fertilization, soil-free cultivation, closed cultivation, hydroponics, or salt-sensitive crops.

With its ability to measure up to 200 mS/cm with the glass/platinum conductivity electrode, the EC 2000 is also suitable for monitoring basis solutions. It is temperature compensated and equipped with a specific conductivity electrode with integrated temperature probe.

TECHNICAL SPECIFICATIONS:

	pH AGRAR 2000
Measurement range:	0 to 14
Resolution:	0.01
Precision:	±0.02
	EC 2000
Measurement range:	Conductivity: 0 to 20 or 200 mS/cm Temperature: +5 to +45°C
Resolution:	Conductivity: 0.1 mS/cm Temperature: 0.1°C
Precision:	Conductivity: 0 to 20 mS/cm ±2 % 20 to 200 mS/cm ±5 % Temperature: ±0.2°C
	Type-VII advisory kit
Dimensions and weight with case:	450 x 350 x 110 mm approx. 3.5 kg

Art. No.	
1700	**Type-VII advisory kit**
	pH AGRAR 2000 and EC 2000 pH AGRAR 2000 with pH piercing electrode made from glass, pH 4 and pH 7 buffer solutions, KCl refill solution with filler syringe, $CaCl_2$ powder for analysing soil solutions, piercing pin, spray bottle with deionised water, EC 2000 with carbon conductivity electrode, calibration solution (1.4 mS/cm and 12.88 mS/cm), technical manual
1700-P	**Type-VII advisory kit**
	Similar to the 1700, but with glass/platinum conductivity electrode for up to 200mS/cm
	ACCESSORIES
3011	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, fixed, 1 m cable
3033	pH piercing electrode made from glass, with 3 diaphragms, 3 mole/l KCl, without cable
3004	Cable for the pH piercing electrode
3012	pH 4.0 buffer solution, 100 ml bottle
3013	pH 7.0 buffer solution, 100 ml bottle
1004	Spray bottle with deionized water
3022	Refill solution with filler syringe for pH electrodes, 3 mole/l KCl, 100 ml bottle
3017	Dibble
4093	Carbon conductivity electrode
4195	Glass/platinum conductivity electrode
1303	Calibration solution, 1.4 mS/cm 100 ml bottle
1308	Calibration solution, 12.88 mS/cm 100 ml bottle
1304	Calibration solution, 111.8 mS/cm 100 ml bottle
2014	Beaker for measuring volume, 100 ml with cover
4444	Technical manual
3019	One nine-volt battery, size 6LR61

NITRAT 2000

2019

„Accuracy: **very good**
Time needed: **5 minute for preparation and calibration; minimal when taking several measurements**"
In compliance with the Saxon State Office for the Environment, Agriculture and Geology;
Publication series Issue 10/2009

NITRAT 2000 advisory kit

This straight-forward, microprocessor-controlled meter uses an ion-selective electrode to measure the nitrate concentration in a liquid. A simple slurry can be made with deionised water in order to measure substrata and soil. Turbidity does not have an effect on the measurement results. Nitrate contents up to 1,000 mg/l (ppm) can be accurately measured. This eliminates the possibility of errors caused by dilution. A nitrate combination electrode can be used for the measuring system. The calibration should be carried out with our calibration solution (included).
We recommend that you use our Nitrat 2000 Advisory Kit when preparing your test samples. It contains all the necessary accessories, as listed below.

TECHNICAL SPECIFICATIONS:

Measurement range:	NO_3: 0 to 1,000 mg/l
Resolution:	NO_3: 1 mg/l
Precision:	NO_3: ±5 %
Display:	LCD display
Operating temperature:	During operations: +5 to +45 °C
Power supply:	One nine-volt battery, size 6LR61
Run time:	approx. 100 hours
Protection class:	IP40
Dimensions and weight:	125 x 75 x 45 mm, 190 g
Dimensions and weight with case:	350 x 280 x 100 mm approx. 1.8 kg

NITRAT 2000 soil kit

Advisory kit for simple and quick determination of the nitrate content in the field. The NITRAT 2000 is easy to use and delivers quick reliable results. The meter and accompanying instructions allow you to measure the nitrate content in soil, plants, or organic material. The NITRAT 2000 advisory kit includes all necessary instruments and auxiliary materials. The detailed instructions accompanying the kit describe how to take samples and carry out measurements. They include examples and related reference information.

2011

Art. No.	
2008	**NITRAT 2000**
	Base unit with nitrate electrode
2019	**NITRAT 2000 advisory kit**
	NITRAT 2000 with nitrate electrode, One each of: 1 litre calibration solution 500 mg/l and 50 mg/l of NO_3, 1 litre of extraction solution/alum salt, One each of: 100 ml calibration solution 500 mg/l and 50 mg/l of NO_3, 100 ml of 0.1-mole KCl refill solution with filler syringe, 100 ml conditioning solution, Salt for extraction solution/alum salt, Spray bottle with deionized water, Volume beaker
2011	**NITRAT 2000 soil kit**
	NITRAT 2000 with nitrate electrode, One each of: 1 litre calibration solution 500 mg/l and 50 mg/l of NO_3, 1 litre of extraction solution/alum salt, One each of: 100 ml calibration solution 500 mg/l and 50 mg/l of NO_3, 100 ml of 0.1-mole KCl refill solution with filler syringe, 100 ml conditioning solution, Salt for extraction solution/alum salt, Spray bottle with deionized water, One-litre measurement beaker, Hand mixer, Fine scale (electronic), Folded filter, Sieve with drip pan, Six powder funnels: ∅ 120 mm, Six extraction bottles (0.5 litre), Volume beaker, Plastic shovel
	ACCESSORIES
2017	Nitrate electrode
2018	Calibration solution, 500 mg/l NO_3, 1 l bottle
2023	Calibration solution, 50 mg/l NO_3, 1 l bottle
2028	Calibration solution, 500 mg/l NO_3, 100 ml bottle
2034	Calibration solution, 50 mg/l NO_3, 100 ml bottle
2027	Refill solution with filler syringe for nitrate electrodes, 0.1 mole/l KCl, 100 ml bottle
2024	Conditioning solution, 100 ml bottle
2035	Salt for 5 l extraction solution/alum
1004	Spray bottle with deionized water
2036	Extraction solution/alum, 1 l bottle
2014	Beaker for measuring volume, 100 ml with cover
1009	Hand mixer
0810	Strainer, 4 mm / 330 x 190 mm with drip pan
2033	100 folded filters for analysis, ø 240 mm
2031	Powder funnel, ø 120 mm
3019	One nine-volt battery, size 6LR61

NITROGEN QUICK TEST

Filter beaker

N-min nitrogen quick test

This straight-forward set is used for manually determining the nitrogen content. It includes a filter beaker for outdoor soils and substrate, 50 round filters, 50 nitrate test strips and a 100-ml beaker for measuring volume. Tables and worksheets for N-outdoors, N-substrata and N-sap are also included.

Art. No.	
2000	**Filter beaker for N-min nitrogen quick test**
2001	**Supplemented with pH test strips and tables**

AGROS NOVA

Meter for liquid manure

This measuring instrument allows you to determine the nitrogen content in your liquid manure. Measurements can be made in the field or at your farm in a matter of minutes. Our nitrogen measuring system makes targeted manure fertilization possible. The TS and phosphorus content can also be calculated.

Art. No.	
2016	**AGROS NOVA meter for liquid manure**
	AGROS NOVA complete in case, with reagent, pH booster, areometer (density hydrometer) and measuring spoon
	ACCESSORIES
2097	Reagent, pH booster

NITRATE QUICK TEST

Hand-held sampling pliers

Obtaining plant sap

The hand-held sampling pliers are mainly used for obtaining sap from plant parts and assessing the second N-fertilization for winter grains.

TECHNICAL SPECIFICATIONS:

Material:	Stainless steel Precision manufactured
Weight:	485 g
Length:	170 mm
Compressed surface:	24 x 22 mm

Art. No.	
2007	**Hand-held sampling pliers**

NITRATE AND NITROGEN MEASUREMENT CHAPTER 6

NITRACHEK ADVISORY KIT FOR N/MIN ANALYSIS

Nitrate-nitrogen advisory kit

Determines nitrate content in soil

The nitrate-nitrogen advisory kit allows you to carry out quick on-site tests to determine the nitrate content in fruits and plant material. It is important to determine the correct amount of nitrogen needed at the correct time for your crops.

The instruction manual includes safety tips and practical recommendations for working with soils (N_{min}) with varying depths and when working with water, vegetables, potatoes, grains, corn, sugar beets or grasses. The quantity and quality of your crop will both suffer if you use too little or too much nitrogen. With our nitrate-nitrogen advisory kit, you can accurately determine the proper fertilization schedule for your crops.

Measuring nitrates in fruits, plant materials and soil

Measuring instrument for electronically evaluating the colour scale on Merckoquant nitrate test strips.
The "Nitrachek" system has established itself as an indispensible tool in many countries. New: The previous 20 measurements are saved with date and time stamps. New: Automatic corrective-factor multiplication. When used properly, the Nitrachek delivers results with a statistical stray zone of about ±10 % accuracy. This is a respectable value for this application range.

Art. No.	
2002	**Nitrate-nitrogen advisory kit**
	ACCESSORIES
2009	Nitrachek reflectometer, Measuring instrument for electronically evaluating the colour scale on Merckoquant nitrate test strips
2010	Calibration solution, 100 mg/l nitrate 20 ml bottle
2005	100 nitrate test strips
2006	100 circular filters, ø 150 mm
2030	Wide-neck extraction bottle, 1.0 l, with top
2014	Beaker for measuring volume, 100 ml with cover
2012	Manual / Operating instructions
2550	8 reaction vessels with stands and dosage syringe
0810	Strainer with wooden frames, 4 mm / 330 x 190 mm with drip pan
4060	Manual scale, 0 to 1,000 g
2020	Timer
2021	Brush for cleaning strainer
5004	Sampling auger, 30 cm
2040	Beaker, 1 litre, with graduation marks
2022	10 sample beakers
3019	One nine-volt battery, size 6LR61

Possible steps in the process

TAKING THE SAMPLE

HOMOGENIZATION

1a) Using sieves to homogenize the soil sample

+

and: weighing the soil sample to determine the nutrient content in mg/kg

or

SINGLE SAMPLE SUBSTRATE

1b) Measuring the sample volume with the graduated sample container (e.g. for horticulture gardening substrata)

or

SINGLE SAMPLE MINERAL SOILS

1c) Measuring the sample volume using the graduated sampling auger (e.g. for mineral soils)

PREPARING THE SAMPLE

2) Adding an extraction agent to the sample

3) Extraction by repeated shaking

4) Filtration of the extract using a round filter

5) Measuring the filtrate with a graduated plastic syringe

ANALYSIS OF SAMPLES

6) Fill the measuring cuvette

7) Add a defined number of drops of the colour reagent

8) Add the reactant.

9) Insert the cuvette into the AMOLA® base unit. Read the measured value directly in kg/ha (mineral soils) or mg/l of substrate (for substrates), or ...

Hand model: Sarah Tobehn

Measurement range *

	Mineral soils		Horticulture substrates	Water samples	Precision
Parameter	**kg/ha**	**mg/kg**	**mg/l of substrate**	**mg/l**	**%**
NH_4	4-80	1-26	13-260	> 0.1	± 5
NH_4-N	3-60	1-20	10-200	> 0.1	± 5
NO_3	130-1,850	40-620	90-1,230	> 4	± 10
NO_3-N	30-420	10-140	20-280	> 1	± 10
PO_4	180-4,500	60-1,500	60-1,500	> 0.6	± 1
PO_4-P	60-1,500	20-500	20-500	> 0.2	± 1
P_2O_5	138-3,450	46-1,150	46-1,150	> 0.5	± 1
K	120-900	40-300	40-300	> 2	± 5
K_2O	144-1,080	48-360	48-360	> 2.5	± 5

* For higher levels out of the measurement range (e.g. 500 mg/l NO_3-N), you should dilute the filtrate with distilled water (e.g. 1:2). The measured result must then be multiplied by the dilution factor (e.g. 250 mg/l measured x 2 = 500mg/l)

Contents of the AMOLA® AGRAR MOBILE LAB case:

Case, Amola base unit, sampling auger, sieve, drip pan, shovel, spatula, scale with weight, filter, measuring cylinder (100 ml), measuring cup (25 ml), funnel, bottle (0.5 l), sample vessels (15 and 50 ml), syringe (5 ml), four glass cuvettes, 1 litre of $CaCl_2$, 2 x 1 litre of CAL, 1 litre of distilled water, nitrite test strips, Visocolor test for ammonium, nitrate, phosphate and potassium, sedimentation tube, glass tamper, pyrophosphate solution

TEL ++49(0)3 66 01/93 49 06 FAX ++49(0)3 66 01/93 49 07 WWW.STELZNER.DE

AMOLA® AGRAR MOBILE LAB with accessories

Using the AMOLA® for photometric determination of NPK

The AMOLA® Agrar Mobile Lab contains all the key reagents, equipment and accessories that you need to make a quick, easy and reliable assessment in the lab or in the field. It can be used to determine any of the main readily soluble, plant-available nutrients: nitrogen, phosphorus and potassium (NPK). It is useful for agriculture, horticulture, tree nurseries and composting plants applications. Consultants and plant production specialists also make use of the AMOLA®.

After a sample is taken, the ammonium NH_4, nitrate NO_3, potassium K and phosphate PO_4 in the soil are converted by extraction into liquids and treated with a specific colour reagent. The intensity of the colour indicates the quantity found in the soil of each of these substances.

The Amola® base unit provides you with an objective determination of the colour intensity. The sample type (e.g. mineral soil, substrate, water) and the desired soil component are first specified – then the desired measurement is displayed using the relevant units. For mineral soils, the displayed unit is kg/ha (kilograms per hectare) or mg/kg soil (milligrams per kilogram). For horticulture substrates the unit is in mg/l of substrate (milligrams per litre), and for water samples the unit is mg/l (milligrams per litre).

Ammonium can be specified as NH_4 and NH_4; nitrate can be specified as NO_3 and NO_3-N. The total nitrogen is determined from the sum of the ammonium- and nitrate-nitrogen (NH_4-N + NO_3-N). Phosphate is calculated as PO_4, PO_4-P or P_2O_5; potassium is calculated as K or K_2O.

The manual (included here) uses simple illustrations to describe the sampling, processing, extraction and analysis methods.

TECHNICAL SPECIFICATIONS:

Type:	LED photometer: microprocessor controlled, with auto-test and auto-calibration
Lens:	LED + 2 inference filters
Wavelengths:	450 nm (NO_3-N), 660 nm (NH_4-N, PO_4-P, K)
Precision:	±2 nm, half-width of 10 to 12 nm
Cuvette holder:	Round cuvettes with 16 mm outer diameter Insensitive to ambient light Measurements with uncovered cuvette shaft are possible
Detector:	Silicon photocell
Display:	Illuminated graphical display, 64 x 128 pixels
Operations:	Easy to use with icons on the display Pre-programmed tests for VISOCOLOR® ECO tests Result with dimension specification, date, time
Data storage capacity:	50 measurements
Interface:	Mini USB Free software updates via internet / PC
Operating range:	5 to 50°C at 90% relative humidity
Power supply:	3 AA batteries, rechargeable batteries USB interface; optional internal battery pack
Housing:	Waterproof, IP67 (30 min, 1 m)
Dimensions and weight:	170 x 95 x 68 mm; 0.5 kg

Art. No.	
1806	**AMOLA® AGRAR MOBILE LAB with accessories**
	Contents: see box at left side
1828	**AMOLA® AGRAR MOBILE LAB, base unit**
	ACCESSORIES
5001	Sampling auger with volume graduations
2049	Plastic shovel
2057	Spatula
0810	Sieve with drip pan
4066	High-precision scale: 0 – 500 g with calibration weight
2006	Round filter, MN 615 diameter 150 mm, 100 per package
0570	100-ml graduated cylinder, with graduated scale
2044	250-ml graduated cylinder, with graduated scale
2043	Powder funnel, 80 mm diameter
2029	Wide-neck extraction bottle, 0.5 litre, with top
2058	Sample container, 50 ml, with screw cap and graduated scale
2059	Sample container, 15 ml, with screw cap and graduated scale
2060	5-ml plastic syringe with 0.2 ml graduation marks
2061	MN 10-ml cuvettes with screw cap
1876	$CaCl_2$ extraction concentrate, 1 litre rectangular bottle
1877	CAL extraction concentrate, 1 litre rectangular bottle
2091	Distilled water, 1 litre rectangular bottle
2070	Nitrite test strips, Quantofix (100 tests)
2092	Measuring spoon for Visocolor tests
1886	Visocolor® ECO ammonium 3 (approx. 50 tests)
1895	Visocolor® ECO nitrate (approx. 110 tests)
1889	Visocolor® ECO phosphate (approx. 80 tests)
1883	Visocolor® ECO potassium (approx. 60 tests)
2093	Sedimentation tube
2095	Glass tamper for the sedimentation analysis
2096	Pyrophosphate solution for the sedimentation analysis

STELZNER® soil kit

Mobile nutrient analysis in the field

The STELZNER® soil kit includes all instruments and accessories required for producing the soil extracts and the subsequent determination of phosphate (P), soil structure, potassium (K), pH, ammonium, nitrite and nitrate (N). The soil extracts are produced either with a calcium-acetate-lactate (CAL) solution (for determining P and K) or with a $CaCl_2$ solution (for determining N and pH).

If your national soil-analysis regulations or local geological conditions require, the STELZNER® soil kit can also be equipped with extraction solutions other than $CaCl_2$ or CAL.

The detailed instructions make it easy to carry out on-site analysis of the nutrients. Depending on your requirements, there are different reagents, indicators and instruments available to determine your key nutrients. The AMOLA® (refer to pages 19 or 48) allows you to precisely analyse weak concentrations and a variety of other materials. Reagents and indicators are very useful for making speedy determinations directly in the field. The NITRAT 2000 (refer to page 16) and the Nitrachek (refer to page 17) are excellent choices for measuring nitrate.

Content STELZNER® soil kit
Case, sampling auger, 2-mm strainer with drip pan, precision scale, spray bottle with deionised water, 2 funnels, 100 folded filters, 4 extraction bottles, 100-ml beaker, 2 250-ml beakers and 2 400-ml beakers, 6 volume-measuring beaker with covers, 500-ml screw-top can, plastic syringes, glass stirring rods, 4 0.5-l extraction bottles, 2 plastic shovels, metal scoop, cuvette cell stand with 16 empty 1-l reagents, $CaCl_2$ extraction concentrate and CAL

Art. No.	
1875	**STELZNER® soil kit**
	ACCESSORIES
1876	$CaCl_2$ extraction concentrate, 1 l bottle, for producing the extraction solution
1877	CAL extraction concentrate, 1 l bottle, for producing the extraction solution
2033	Folder filters for the analysis process, 100 pcs., ø 240 mm
2026	Cuvette cell stand
0810	Strainer, 33 x 19 cm, 2/4/10 mm with drip pan
2031	Powder funnel, ø 120 mm
2043	Powder funnel, ø 80 mm
2042	Liquid funnel, ø 80 mm
2030	Wide-neck extraction bottle, 1.0 l, with top
2029	Wide-neck extraction bottle, 0.5 l, with top
0570	100-ml graduated cylinder Clear PE glass with elongated shape
2044	250-ml beaker with graduation marks
2045	400-ml beaker with graduation marks
2046	Screw-top can, 500 ml
2048	Glass stirrer, ø 10 mm, approx. 15cm
2049	Plastic shovel, 25 ml
2051	Metal scoop, flat surface and spoon

Reagents and indicators

Reagents and indicators for performing nutrient analysis in the field

As a supplement to the soil kit, a variety of VISOCOLOR® reagents or indicators (see page 21) can be used to carry out simple soil analysis in the field. Contact us for more information concerning these additional possibilities for analysis. There are a variety of methods available to suit your individual requirements and required level of precision.

Art. No.	
1861	VISOCOLOR® ECO test kit with colour disc, potassium 2 mg to 15 mg/l K
1862	VISOCOLOR® ECO test kit with colour disc, ammonium 0.5 mg to 15 mg/l NH_4
1863	VISOCOLOR® ECO test kit with colour disc, phosphate 0.2 mg to 5 mg/l PO_4
1864	VISOCOLOR® ECO test kit with colour disc, phosphate 1 mg to 120 mg/l NO_3

Indicators: refer to page 21

Indicators

Additional components or custom packs are available on request.

Quick test

Our non-bleeding indicator sticks are used for taking quick and easy measurements of various parameters in soil solutions and water.

Additional components or custom packs are available on request.

Custom packs can, for example, include 6 test strips in one bag, 50 bags each with 6 test strips in a can, or 150 bags each with 6 test strip per box.

8202

CUSTOM PACKS

TECHNICAL SPECIFICATIONS:

Measurement range:	Ammonium NH_4
Divisions:	0 –10 – 25 – 50 – 100 – 200 – 400 mg/l
Measurement range:	Calcium Ca
Divisions:	0 –10 – 25 – 50 – 100 mg/l
Measurement range:	Carbonate hardness
Divisions:	0 –3 – 6 – 10 – 15 – 20 °d
Measurement range:	Chloride Cl
Divisions:	0 – 500 – 1,000 – 2,000 – 3,000 mg/l
Measurement range:	Chlorine Cl_2
Divisions:	0 - 0.1 – 0.5 – 1 – 3 – 10 mg/l
Measurement range:	Iron Fe
Divisions:	0 – 2 – 5 – 10 –25 – 50 – 100 mg/l
Measurement range:	Potassium K
Divisions:	0 – 200 – 400 – 700 – 1,000 – 1,500 mg/l
Measurement range:	Copper Cu
Divisions:	0 – 10 – 30 – 100 – 300 mg/l
Measurement range:	Nitrate NO_3
Divisions	0 – 10 – 25 – 50 – 100 – 250 – 500 mg/l

Measurement range:	Nitrate NO_3 / Nitrite NO_2
Divisions:	0 – 10 – 25 – 50 – 100 – 250 – 500 mg/l
	0 – 1 – 5 – 10 – 20 – 40 – 80 mg/l
Measurement range:	Nitrite NO_2
Divisions:	0 – 1 – 5 – 10 – 20 – 40 – 80 mg/l
Measurement range:	pH test
Divisions:	0 to 14 with 1-pH divisions
Measurement range:	pH test
Divisions:	2 to 9 with 0.5-pH divisions
Measurement range:	Phosphate PO_4
Divisions:	0 – 3 – 10 – 25 – 50 – 100 mg/l
Measurement range:	Water hardness
Divisions:	< 3 > 5 > 10 > 15 > 20 > 25 °d
Measurement range:	Hydrogen peroxide H_2O_2
Divisions:	0 to 25 mg/l
Measurement range:	Zinc Zn
Divisions:	0 – 10 – 25 – 50 – 100 – 250 – 500 mg/l
Multi-sticks for aquarium use:	Total hardness: 5° to 25° d
	Carbonate hardness: 3° to 20° d
	pH: 6.4 to 8.4

Art. No.	
2071	**Ammonium*** (100 tests)
2073	**Calcium*** (60 tests)
2074	**Carbonate hardness** (100 tests)
2072	**Chloride** (100 tests)
2068	**Chlorine** (100 tests)
2075	**Iron*** (100 tests)
2076	**Potassium*** (100 tests)
2077	**Copper** (100 tests)
2085	**Multi-sticks for aquarium use** (100 tests)
2005	**Nitrate Merckoquant** (100 tests)
2069	**Nitrate / Nitrite** (100 tests)
2070	**Nitrite** (100 tests)
8400	**Oiltest** (100 tests)
2083	**pH test 0 – 14** (100 tests)
2084	**pH test 2 – 9** (100 tests)
2078	**Phosphate*** (100 tests)
2082	**Water hardness** (100 tests)
2079	**Hydrogen peroxide** (100 tests)
2080	**Zinc*** (100 tests)
	* Test strips with reagents
	CUSTOM PACKS
8200	**pH test 0 –14** (150 bags, each with 6 test strips)
8202	**pH test 0 –14** (bag with 6 test strips)
8203	**pH soil test kit** (4 bags each with 6 test strips, beaker, 20 circular filters, funnel)
8204	**Nitrate/pH-soiltest-kit** (4 bags Nitrate and pH with 6 test each, beaker, 20 circular filters, funnel)
8302	**Water hardness** (bag with 6 test strips)
8102	**Nitrate** (bag with 6 test strips)
8402	**Oiltest** (bag with 6 test strips)
8602	**Pollutant test** (bag with 6 test strips)
8502	**Indicator-set** (bag Nitrate, water hardness and pH with 6 test stripes each)

PORTABLE LIQUID MEASUREMENTS

TM 40, ISE 40, LF 40, AM 40

Measures pH, redox, ion concentrations, conductivity and dissolved gases

These measuring devices offer the advantages of a mobile field unit together with the precision and comfort of a laboratory instrument: with high measurement accuracy, a multifunction graphic display, integrated data logger and heavy-duty IP65 housing. The important GLP functions – such as date/time, primary measured value, secondary measured value (including the physical units), temperature and device number – are transmitted and recorded in the data file. The TM 40 features automatic temperature compensation for pH measurements and manual temperature input when measuring without a temperature sensor. Either manual or automatic two-point calibration is available for the calibration. The measuring device can also be used to measure the redox potential or ISE potential relative to the standard hydrogen electrode, in accordance with DIN 38404.

TECHNICAL SPECIFICATIONS:

Measurement range:	
TM 40	pH: 0 to 14; -1,999 to 1,999 mV;
ISE 40	0.1 to 1,000 mg/l
LF 40	LF: 0 to 200 µS/cm; 0 to 2,000 µS/cm; 0 to 20 mS/cm; 0 to 500 mS/cm; automatic measuring range switch-over; TDS: 0 to 200 mg/l; 0 to 2,000 mg/l; 0 to 20 g/l; 0 to 500 g/l; Salinity: 0 to 70 g/kg;
AM 40	O_2: 0 to 200 %; 0 to 20 mg/l
Resolution:	
TM 40	0.01 pH; 1 mV
ISE 40	0.1 mg/l
LF 40	0.1 µS; 1 µS; 0.01 mS; 0.1 mS
AM 40	1 %; 0.01 mg/l, Temperature: 0.1°C
Precision:	
TM 40	+/- 0.02 pH; +/- 1 mV
LF 40	+/- 1% to 200mS
AM 40	+/- 1 %; +/- 0.01 mg/l
Display:	graphic LCD, 128 x 64 pixels, back-lit
Communication port:	USB, electrical/galvanic isolation
Data logger:	4,000 data records
Power supply:	3 x AA, IEC R6, LR6, 1.5V
Protection degree:	IP65
Dimensions and weight:	200 x 95 x 40 mm, approx. 290 g

Art. No.	
7130	**TM 40 Set**
7140	**ISE 40 Set**
7120	**LF 40 Set**
7110	**AM 40 Set**

Each measuring device is delivered in a set with probe/electrode, solutions and spare parts (AM 40) in a case

The ISE 40 takes temperature-compensated measurements of ion concentrations across a wide range of concentrations. The LF 40 is perfectly suited for checking electrical conductivity, salinity and temperature in surface waters, waste water and during waste water treatment. The AM 40 is ideal for checking oxygen content in surface waters, waste water and during waste water treatment. The measuring device, in communication with the sensor, simultaneously detects the mass concentration of the dissolved oxygen in mg/l, the oxygen saturation index (% saturation) and the temperature.

LIQUIDS ANALYSIS CHAPTER 8

PORTABLE LIQUID MEASUREMENTS

LM 3000

Measures pH, redox, ion concentrations, conductivity and dissolved gases

The LM 3000 multi-parameter laboratory controller has a modular bus structure; it provides excellent functionality, maximum operational reliability, outstanding ease of use, and a wide range of customized configuration options.

The LM 3000 offers a complete system solution whenever several electrochemical quality parameters need to be detected on-line in a laboratory setting, and where these measurements need to be transmitted and evaluated very reliably.

TECHNICAL SPECIFICATIONS:

Auxiliary power:	24 VDC desktop power supply unit, voltage cut-off switch on the device
Ambient temperature:	0 to +40°C
Display:	Graphic touchscreen display 320 x 240 pixels, 256 colours, backlit
Menu languages:	German, English
Data transfer:	Ethernet interface, USB interface for PC connection, serial RS-232 interface
Control outputs:	4 potential-free relay outputs; resistive load of I ≤ 1 A, U ≤ 24 V DC for limit or alarm function; one relay with timer function (washing contact; time interval is adjustable from 1 to 9,999 hours)
Data storage:	built-in data logger for 100,000 values, including date and time, finite / ring storage, 48-hr data recorder
Log book:	approx. 200 activities, including date and time
Housing:	Aluminium console housing IP40/DIN EN 60529
Connections:	BNC, Banana, 8-pin DIN, BK, USB, Ethernet
Measuring modules:	four internal measuring modules; can be combined as needed; galvanic-isolated inputs; storing of calibration data; sensor monitoring using adjustable limit ranges; manual and automatic temperature compensation;
Controller module:	PID 3000, standard signal module 4 x 0(4) to 20 mA
GLP:	GLP functions (data recording)

Art. No.	
LM 3000	**Multi-parameter controller base unit**

Measuring module for pH, conductivity, ISE etc.: available on request

The main functional units of the LM 3000 multi-parameter laboratory measurement system are:

- The LM 3000 multi-parameter laboratory base unit with power supply, touchscreen display (backlit 5.7", 320 x 240 pixels, with full-text menu navigation) 4 potential-free (floating) relay outputs, data logger and logbook, various digital interfaces such as RS232, USB and Ethernet
- Internal measuring modules (max. 4)
- PC-based visualization program
- Sensors
- Optional sampler, up to 72 samples depending on type (e.g. TW Alpha plus)
- Optional Titronic 500 dosage system
- Optional stirrer

STATIONARY LIQUID MEASUREMENTS

MV 4000 transmitter series

Measuring amplifier

This series of transmitters is suitable for inexpensive measurements of one or more process variables. The transmitters are very versatile and easy to use. Calibrations are easy to carry out directly at the transmitter. The MV 4000 has an additional display which facilitates the control of measured values, calibrations, and also enables each transmitter to be used as an independent measuring instrument

TECHNICAL SPECIFICATIONS:

Parameters:	1 x pH, redox, conductivity, O_2, ISE (NH_4, NO_3, K, Cl, F, etc.)
Display:	LCD
Analogue outputs:	2 x 0(4) to 20 mA, or 0 to 5 VDC
Control outputs:	1 x normally open contact: max. 125 VAC, 60 VDC, 30 VA
Interface:	USB
Power supply:	15 to 24 VAC/DC, approx. 1.5 VA
Housing:	Plastic for top-hat rail mounting DIN EN 50022-35
Protection degree:	IP40 (EN 60529)
Dimensions:	45 x 99 x 114.5 mm

It can also be connected to the event reporting system (refer to page 41).

Art. No.	
MV4010	**pH transmitter** 0 to 14 pH
MV4020	**Conductivity transmitter** 0 to 20 mS/cm
MV4016	**ISE transmitter** NH_4, NO_3, etc.
	Others available on request

KM 3000

KM 3000 multi-parameter measuring system

The KM 3000 multi-parameter controller has a modular bus structure; it provides excellent functionality, maximum operational reliability, outstanding ease, and a wide range of customized configuration options. The KM 3000 offers a complete system solution for any application where multiple parameters need to be detected on-line, and where these measurements need to be transmitted and evaluated very reliably. It also is capable of documenting and controlling processes.

TECHNICAL SPECIFICATIONS:

Parameters:	Max. of 16: pH, redox, conductivity, O_2, ISE (NH_4, NO_3, K, Cl, F, etc.)
Display:	5.7" touchscreen
Data logger:	Approx. 100,000 parameter sets
Analogue outputs:	4 x 0(4) to 20 mA
Relay outputs:	4 x potential-free outputs, max. 3 A, 250 VAC
Interface:	USB, RS285, RS485
Power supply:	115/230 VAC, 48 to 63 Hz or 15 to 30 VAC/DC
Housing:	Wall mount, in aluminium
Protection degree:	IP65 (EN 60529)
Dimensions:	240 x 240 x 120 mm

It can also be connected to the event reporting system (refer to page 41).

Art. No.	
KM3000	**Multi-parameter** controller base unit
MVM2210	**pH measuring module** 0 to 14 pH, without electrode
MVM2216	**ISE measuring module** NH_4, NO_3, etc., without electrode
MVM2220	**Conductivity transmitter** 0 to 20 mS / cm, without electrode
GSM3000	**GSM/GPRS modem**
	Others available on request

MV 50XX series

MV 50XX single-channel measuring transducer

The MV 50XX series of measuring transducers is perfect for taking stationary measurements directly at the measuring point in the open field. The measuring transducer is simple and intuitive to use. It also maintains the essential functionality with maximum operational reliability and safety. Each MV 50XX features a large OLED display and plain-text menu navigation. The software also enables you to configure, calibrate, view and record measured values at your PC using a standard USB port.

Areas of use:
- Water treatment
- Water-quality monitoring systems
- Process monitoring
- Process control

Special features:
- Cost-effective measurement of process variables
- Easy to use (plain text menus)
- Simultaneous temperature measurements and compensation
- 2 scalable analogue outputs and 2 relay outputs
- USB interface and PC software
- Firmware update via USB
- IP65 field housing

It can also be connected to the event reporting system (refer to page 41).

TECHNICAL SPECIFICATIONS:

Parameters:	1 x pH, redox, conductivity, O_2, ISE (NH_4, NO_3, K, Cl, F, etc.)
Display:	graphic OLED, 128 x 64 pixels with plain text menu
Analogue outputs:	2 x 0(4) to 20 mA, or 0 to 5 V
Control outputs:	2 limit switch contacts, CO contact, max. 250 V AC / 5 A; PID controller, bi-directional (pulse length or analogue controller)
Interface:	USB (optional RS-232)
Power supply:	100 to 240 V AC, 18 to 36 V DC
Housing:	Aluminium housing for wall mount
Protection degree:	IP65
Dimensions:	160 x 130 x 70 mm

Art. No.	
MV5010	**pH measuring transducer** 0 to 14 pH
MV5020	**LF measuring transducer** 0 to 20 mS/cm
MV5040	**ISE measuring transducer** NH_4, NO_3, etc.
MV5030	**O_2 measuring transducer** 0 to 20 mg/l

FOOD MEASUREMENTS

Refractometer

For wine, honey and fruit juices

Refractometers are precise optical instruments for measuring dissolved materials in water-based solutions. Their functionality is based on the principle of varying optical refraction in liquids: light travels through a liquid and the angle of refraction is measured against a scale. This indicates the quantity of dissolved solids in the liquid.

Its easy to use: simply apply one drop of the sample liquid on the prism and then read the results right away on the scale. The device is very easy to calibrate. The visual focus is adjustable. The refractometer (ATC) is temperature compensated at 20°C.

The MR200ATC is used to determine the must or sugar content in the fruit and wine-making industries. It can also be used to determine the degree of ripening for fruits such as tomatoes, melons or kiwis. The MR90ATC can be used to determine the water and sugar content in honey.

Additional versions are available on request.

TECHNICAL SPECIFICATIONS:

	MR200ATC
Measurement range:	0 to 140 °Oe 0 to 25 °KMWBabo 0 to 32 % Brix
Resolution:	1 °Oe 0.2 °KMWBabo 0.1 % Brix
Precision:	±1 °Oe ±0.2 °KMW Babo ±0.1 % Brix
Dimensions and weight:	175 x 30 mm, approx. 165 g
	MR90ATC
Measurement range:	58 to 90 % 38 to 43 Be' 12 to 27 % water
Resolution:	0.5 % 0.5 Be' 1 %
Precision:	±5 % ±0,5 Be' ±1 %
Dimensions and weight:	175 x 30 mm, approx. 165 g

Art. No.	
4041	**MR200ATC refractometer**
4049	**MR90ATC refractometer**

Digital Refractometer

For wine, honey and fruit juices

The digital refractometer is an optimal instrument used to measure the specific gravity (in Brix) of water-based solutions (such as fruit juice or wine). It features automatic temperature compensation (ATC). The measurement procedure is simple and quick. After a simple calibration using deionised water, the sample can be measured. The measurement is then displayed within seconds in %Brix.

With the digital refractometer you avoid the measurement inaccuracies that occur with mechanical instruments. It is also quite easy to bring and put to use anywhere on-site.

The temperature is displayed alongside of a battery-change indicator and other helpful information.

Conversion tables for specific gravities (in Oechsle degrees), g/l sugar, alcohol content and KMW/ Babo measurements are also included.

TECHNICAL SPECIFICATIONS:

Measurement range:	Brix: 0 to 85% Temperature: 0 to +85 °C
Resolution:	Brix: 0,1 % Temperature: 0.1 °C
Precision:	Brix: ± 0,2 % Temperature: ± 0.3 °C
Operating temperature:	10 to +40 °C
Power supply:	One 9-Volt AA battery
Run time:	approx. 5,000 measurements
Protection class:	IP65
Dimensions and weight:	192 x 102 x 67 mm, approx. 420 g

Art. No.	
4045	**Digital Refractometer**

MEASURING THE RIPENESS STAGE

Fruit penetrometer

Monitoring the degree of ripeness

The fruit penetrometer is used to monitor the ripeness stage and to check the consistency of the inner fruit flesh. It is very useful in the field for determining the best harvest time. Moreover, it can be used for quality control during storage or after transport. A variety of versions are available for different types of fruit. The standard version can be used for measuring fruits such as apples, pears or citrus. Custom versions (for example, for nuts) are available on request.

TECHNICAL SPECIFICATIONS:

Measurement range:	13 kg or 29 lb
Resolution:	0.1 kg or 0.25 lb
Precision:	± 1% MBE at 20 °C
Puncture tips:	1 cm^2 0.5 cm^2
Dimensions and weight:	112 x 59 x 24 mm, approx. 106 g
Dimensions and weight with case:	146 x 74 x 33 mm, approx. 250 g

Art. No.	
4610	**Fruit penetrometer** Base unit with 2 puncture tips, splatter guard, peeler and case

MEASURING FRUIT SIZE

Fruit rings / sorting calibres

Sorting with calibres

Quickly ascertain fruit size with the compartmentalized widths of the sorting calibre.

Art. No.	
4620	**Sorting calibre** 10 – 50 mm
	9 compartments, stainless steel ± 0.5 mm, 5 mm steps
4621	**Sorting calibre** 55 – 120 mm
	14 compartments, stainless steel, ± 0.5 mm, 5 mm steps
4622	**Sorting calibre** 30 – 90 mm
	13 compartments, aluminium 5 mm steps

Potato template

Size determination with sorting templates

Potato sorting templates feature multiple variable-sized compartments for quickly determining the size.

TECHNICAL SPECIFICATIONS:

Measurement precision:	± 0.5 mm
Material:	Stainless steel
Measuring slots:	25 to 70 mm
Compartments	13 sections

Art. No.	
4623	**Potato template**

Calibre for sorting asparagus

For measuring asparagus stalks

For measuring the length and thickness of asparagus stalks.

TECHNICAL SPECIFICATIONS:

Measurement precision:	± 0.5 mm
Material:	Plastic
Measuring slots:	3, 6, 8, 10, 12, 14, 16, 18, 20, 26, 36 mm
Length determination:	10, 12, 17, 22, 27 mm

Art. No.	
4640	**Calibre for sorting asparagus**
	Sorting templates for tomatoes, soft fruits, nuts and peaches/nectarines are available on request.

FRUIT ANALYSIS CHAPTER 9

MEASURING FRUIT SIZE

All-purpose measuring loop

Measuring with the all-purpose loops

All-purpose metal loop with flexible adjustment: for continuously variable measurement of fruit size from 32 mm to 95 mm circumference. With diameter display and pouch included.

All-purpose plastic loop with flexible adjustment: for continuously variable measurement of fruit size from 20 mm to 100 mm circumference.

Art. No.	
4630	**All-purpose measuring loop** 32 mm to 95 mm, metal
4631	**All-purpose measuring loop** 20 mm to 100 mm, plastic

SOIL MEASUREMENTS

Oxygen/temperature lance

Oxygen and temperature analysis for composting

In industrial composting plants, oxygen concentrations and temperature must be monitored in order to optimize the decay process. The oxygen lance, equipped with an amperometric Clark O_2 sensor, can reliably measure oxygen concentrations in compost. When connected into a control/ventilation system, the lance can be used to control the ventilation of the decaying materials during the intensive rot stage. This ensures that sufficient oxygen is available for the quick and complete aerobic conversion of the material. The ventilator uses very little power and water loss in the rotting material is minimal. As a result, it is possible to skip the time-consuming and costly step of turning over the rotting material. This reduces the amount of disturbing odours.

Measurements can be taken directly on site when used in conjunction with the AM 40 hand-held meter (refer to page 22). The stationary MV 5030 meter (refer to page 23) can be used for a variety of control solutions. It can also be connected to the event reporting system (refer to page 41).

TECHNICAL SPECIFICATIONS:

	MF 441 BK sensor
Measurement range:	O_2: 0 to 25 vol. %
	Temperature: +5 to +80°C
Operating temperature:	+5 to +80°C
Air humidity:	max. 100% relative humidity – but with no condensation on the sensor membrane
Dimensions:	Shaft length: approx 100 mm
	Shaft diameter: 18 mm
Material:	FEP, 1.4571 stainless steel, POM
	Oxygen/temperature insertion probe
Material:	Stainless steel WS 1.4571 (DIN 17440), certified crystal alloy for special requirements
Operating temperature:	0 to +80°C
Dimensions:	ø 22 mm (shaft), approx. 28 mm (tip), Total length: approx. 1,100 mm
Weight:	approx. 2.5 kg

Art. No.	
4035	**Oxygen/temperature lance MF 441 BK**
4520	**AM 40 K set**

AMBIENT AIR MEASUREMENTS

SenseLife

Carbon dioxide, air humidity and temperature measurements

The SenseLife ambient air monitor is a cost-effective meter used for monitoring the humidity and quality of indoor air spaces. All key climatic air parameters are monitored: carbon dioxide (CO_2), air humidity and temperature.

All three measurements are displayed simultaneously. Visual and acoustic alerts are issued when a measurement exceeds a healthy limit. The SenseLife displays the date and time and features a time alarm function.

TECHNICAL SPECIFICATIONS:

	SenseLife
Measurement range:	CO_2: 0 to 10,000 ppm
	Air humidity: 0 to 90 % rel. humidity
	Temperature: -20 to +50 °C
Precision:	CO_2: ±50 ppm + 5 % MW
	Air humidity: ±5 % MW
	Temperature: ± 1 °C
Dimensions and weight:	115 x 108 x 63 mm, 180 g
Power supply:	230 VAC / 60Hz / 5 VDC

Art. No.	
4500	**SenseLife ambient air monitor**

Carbon dioxide meter

Portable measurement of carbon dioxide

This meter is a precise instrument with dual-channel infrared sensor for measuring carbon dioxide. It is suitable for mobile monitoring of environmental air conditions.

It also allows you to perform long-term monitoring with determination of maximum and average values. It is ideal for monitoring the carbon dioxide (CO_2) concentrations within greenhouses during CO_2 fertilization.

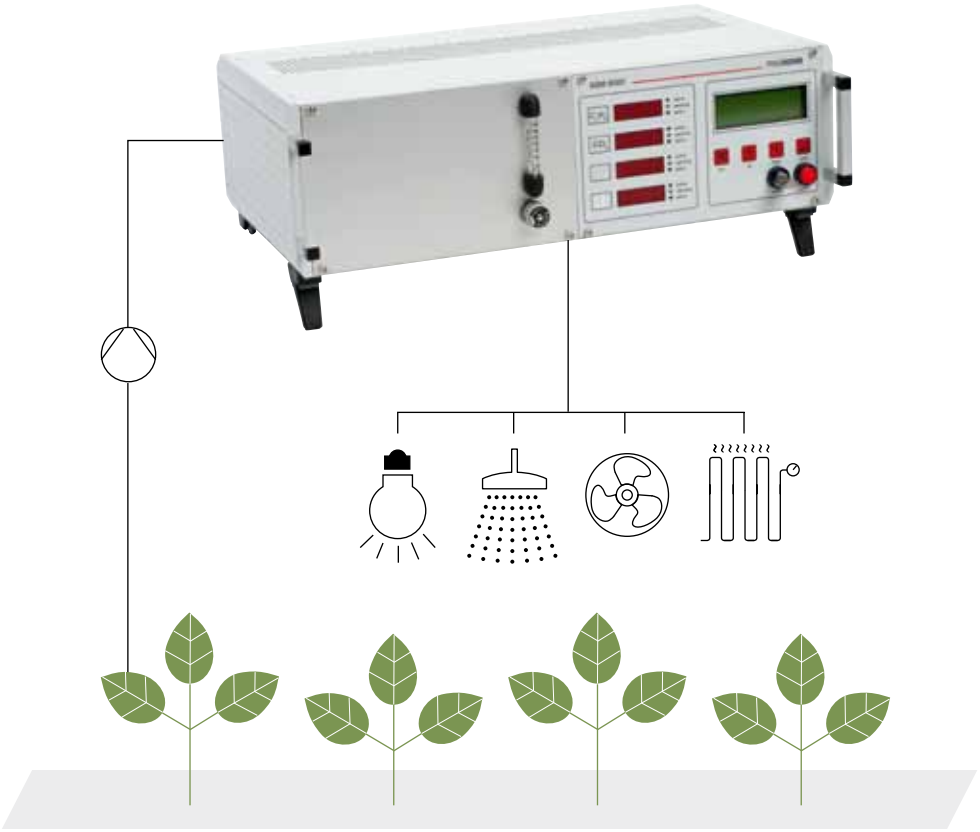
TECHNICAL SPECIFICATIONS:

	Carbon dioxide meter
Measurement range:	0 to 9,999 ppm
Precision:	±3 % MBE to 5,000 ppm, above: ±4 % MBE
Resolution:	1 ppm
Display:	two-character LCD display
Operating temperature:	0 to +50 °C
Power supply:	One nine-volt battery, size 6LR61
Run time:	6 hours
Dimensions and weight:	190 x 57 x 42, 300 g

Art. No.	
4344	**Carbon dioxide meter**
	ACCESSORIES
4034	TOP-SAFE protects against dirt and impact
4039	Log printer

Phyto monitoring

Art. No.	
6000	SSM 6000 Phyto



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ZIM Zentrales Innovationsprogramm Mittelstand

Measurements of ethylene and carbon dioxide in plants and crops

The SSM 6000 Phyto stationary analysis system is used for continual measurements of ethylene and carbon dioxide in plants and crops.

Using gas exchange measurements on plant parts (such as on leaves or fruits), it is possible to determine information on plant growth and biological activity. Conditions for plant growth can be optimized and resource usage can be minimized by measuring the concentrations of ethylene and carbon dioxide.

The limit values for plant stress conditions can be determined using these measured variables. This information can then be used in conjunction with an automation system to provide process control within the greenhouse.

TECHNICAL SPECIFICATIONS:

Measurement range:	
C_2H_4	10 ppm
CO_2	2,000 ppm
Measurement technique:	
C_2H_4	Electrochemical sensor
CO_2	NDIR measurement
Resolution:	
C_2H_4	1 ppb
CO_2	0.1 ppm
Repeat accuracy:	
C_2H_4	2% of measured value
CO_2:	2% of measured value
Detection limit (2σ~):	
C_2H_4	2 ppb
CO_2	2 ppm
Long-term stability:	
C_2H_4	high long-term stability
CO_2	high long-term stability with proCAL
Display:	4-character LED display, status screens, 4-character LCD display
Communication port:	RS232, 4 to 20 mA
Operating temperature:	+5 to +40°C
Power supply:	AC 85-264 VAC, 47-63 Hz
Protection degree:	IP40
Dimensions and weight:	300 x 400 x 165 mm, approx. 10kg
Options:	Profibus DP, several measuring points, etc.
Special features:	Data storage

PROCESS MEASUREMENTS

SSM 6000

Biogas analyser for CH_4, H_2S, O_2 and CO_2

The SSM 6000 has been designed specifically for the non-continuous analysis and periodic process monitoring of gases resulting from biological processes (such as biogas, sewage gas or landfill gas). It measures and displays all critical gas types, including methane and carbon dioxide (infrared), hydrogen sulphide and oxygen (electrochemical). The analyser features an integrated measurement-gas preparation. It is enclosed in a wall-mount housing. Besides the illuminated LCD screen, it also has a four-character LED status display for each type of gas measured.

The SSM 6000 LT (H_2S max 1000 ppm) is well suited for routine and cost-effective monitoring procedures.

TECHNICAL SPECIFICATIONS:

Measurement range:	CH_4: 0 to 100 vol.% CO_2: 0 to 100 vol.% O_2: 0 to 25 vol.% H_2S: 0 to 5,000 ppm
Resolution:	CH_4: 0.1 vol.% CO_2: 0.1 vol.% O_2: 0.1 vol.% H_2S: 1 ppm
Display:	4-character LED display, status screen, 4-character LCD display
Communication:	RS232, 4–20 mA
Operating temperatures:	+5 to +40 °C
Power supply:	AC 85-264 VAC, 47-63 Hz
Protection class:	IP40
Dimensions and weight:	300 x 400 x 165 mm, approx. 10 kg
Options:	Profibus DP, multiple measuring points, hydrogen H_2 (instead of CO_2)
Features:	Data storage capabilities

Art. No.	
6004	**SSM 6000 for CH_4, H_2S, O_2 and CO_2**
6003	**SSM 6000 for CH_4, H_2S and O_2**
6002	**SSM 6000 for CH_4 and H_2S**
6012	**SSM 6000 LT for CH_4 and H_2S**

Additional configurations and options available on request

BIOGAS ANALYSIS CHAPTER 11

ENVIRONMENTAL AND PROCESS MEASUREMENTS

FOS/TAC 2000

Fermenter analysis

This instrument is used for automatically measuring the FOS/TAC content at biogas facilities. Facility operators can use this automatic titrator to determine the FOS/TAC content. It is easy to use and delivers a high level of repeatable accuracy. The fully automatic system helps to significantly reduce operational errors. This is important, since the current results must always be evaluated in comparison to the previous results.

TECHNICAL SPECIFICATIONS:

FOS:	1 to 10 g org. acids/kg substrate
TAC:	5 to 20 g of $CaCO_3$/kg substrate
FOS/TAC:	0.05 to 2.0 [/]
Measurement technique:	pH measurement
Precision:	+/- 0.01 pH
Sample volume:	approx. 5 g filtrate
Protection degree:	IP20, in accordance with DIN 40 050
Dimensions:	approx. 405 x 290 x 160 mm
Weight:	approx. 7.5 kg

Art. No.	
2500	**FOS/TAC 2000**
2501	**Case for the FOS/TAC 2000**

	REPLACEMENT PARTS AND WEARING PARTS
1998	1 bottle of titrate solution, 1,000 ml
1999	1 canister of titrate solution, 5,000 ml
3012	1 bottle of buffer solution, pH 4, 100 ml bottle
3013	1 bottle of buffer solution, pH 7, 100 ml
3014	1 bottle of buffer solution, pH 4, 1,000 ml
3015	1 bottle of buffer solution, pH 7, 1,000 ml
3022	1 bottle of refill solution, pH electrode, 3 mol/l KCl, 100 ml bottle + syringe
1940	1 pH electrode with ceramic diaphragm, liquid electrolyte 3 mol/l KCl

WIRELESS WEATHER STATION

PRIMUS wireless weather station

4210

4211

4212

4214

Art. No.	
4210	**PRIMUS wireless weather station**
	Wireless weather station with thermo-hygro sensor, wind sensor with solar module, Rain sensor with solar module, PC software on CD (in German and English), USB transceiver
	ACCESSORIES
4211	**Thermal-hydro sensor**
4212	**Water sensor**
4214	**Wind sensor**

For measuring temperature, air humidity, rain quantity, wind strength, wind direction and air pressure

The PRIMUS weather station covers all the requirements needed for state-of-the-art weather recording. Its feature set, including its seamless method of transferring weather data to a PC, defines a new standard of excellence. Measurement from the weather station's outdoor sensors are clearly displayed on a large easy-to-read screen. This gives you an immediate overview of all key data, while the display of additional measurements can also be activated as needed. The outdoor units can be positioned wherever you need them because they have a wireless connection to the base station. Data can be be transmitted from 50 to 100 meters over a secure 868 MHz frequency band. The Heavy Weather Pro software application allows you to to receive weather measures with the USB transceiver (included in the delivery). Multiple sensors can be positioned to send indoor and outdoor measurements to your weather station, which you can then monitor and save on your PC. You can also use this application to create tables and graphs, analyze historical data, and identify trends and tendencies.

The transmission range is:

– Thermo-hygro sensor: approx. 100 m
– Rain sensor and wind sensor: approx. 50 m
– Wireless transmission of outdoor measurements via 868-MHz transmitter
– Displays: indoor and outdoor temperature; indoor and outdoor humidity; absolute and relative air pressure; air pressure tendencies; rainfall amount; wind speed and wind direction; windchill factor and dew point.
– Graphical display of the air pressure curve for the last 72 hours.
– Weather forecast; max-min functions.
– Programmable alarms (temperature, storm, etc.)
– Clock and date display with PC updating
– Storage memory for up to 1,750 weather records
– Wireless connection to USB port on PC
– Can be completely controlled via PC
– Measurements can be processed using your own software or Excel on Windows XP or Vista

TECHNICAL SPECIFICATIONS:

Power supply:	Base unit: Two 1.5-V LR14 batteries
	Thermo-hygro sensor: Two 1.5 V C
	Rain gauge: Solar; Wind gauge: Solar
Dimensions:	Base unit: 163 x 220 x 39 mm
Measurement range:	Indoor temperature:–40 °C to +59.9 °C
	Outdoor temperature: –40 °C to +59.9 °C
	Air pressure: 920 to 1,080 mbar
	Indoor air humidity: 1% to 99% rel. humidity
	Outdoor air humidity: 1% to 99% rel. humidity
	Wind speed: 0 bis 180 km/h
	Wind gust speed: 0 to 50 m/s
	Wind chill / dew point: –40 to +59.9 °C
	Rain quantity: 0 to 9,999 mm and mm/h
Degree of accuracy:	Temperature: 0.1 °C
	Air pressure: 1 mbar
	Air humidity: 1% rel. humidity
	Wind speed: 0.36 km/h
	Wind gust speed: 0.1 m/s
	Rainfall amount: 1 mm/h

WEATHER STATION WITH DATA LOGGER

Professional weather station

Measures temperature, humidity (for soil, foliage and air), rain quantity, light, wind strength, wind direction and air pressure

Up to 15 sensors can be connected to the professional weather station / data logger. This allows all pertinent weather data to be recorded and saved. The sensors can be added, removed and swapped to suit your particular applications. No complex programming or calibration is necessary, since the data logger recognizes these sensors automatically. The non-volatile EEPROM memory ensures the safety of your data during a power or battery outage.

There are ten input channels. These can optionally be expanded to 15 by using an adapter. The entire contents of the 512K memory can be exported in 2.5 minutes. LED lights show operational and battery status. The unit can be mounted on a pole (with max. ø 38 mm) or directly on a wall.

TECHNICAL SPECIFICATIONS:

Measurement intervals:	1 s to 18 h / +20 °C to +50 °C (with alkaline batteries)
Communication port:	RS232
Memory:	500,000 measurements total (512K)
Run time:	approx. 1 year
Protection class:	weather-proof
Dimensions and weight:	180 x 230 x 100 mm, 900g

FOOTNOTES

[1]) – 40 to +75 °C
[2]) – 40 to +75 °C, 0 to 100% rel. humidity
[3]) 0 to 0,40 m³/m³
[4]) max 10 cm/h
[5]) 0 to 2,500 µmol/m²/s
[6]) 0 to 1,280 W/m²
[7]) 0 to 45 m/s
[8]) 0 to 44 m/s, 0 to 358°
[9]) 660 to 1,070 mbar
[10]) 0 to 100 %

Art. No.	
	Professional weather station, data logger
4700	for 4 sensors
4701	for 10 sensors
	Sensors
4702	Temperature sensor [1]
4703	Temperature/air humidity sensor [2]
4704	Soil humidity sensor [3]
4705	Rain gauge [4]
4706	Light (photosynthetic) sensor [5]
4707	Light sensor [6]
4708	Wind speed sensor [7]
4709	Wind speed/direction sensor [8]
4710	Air pressure sensor [9]
4711	Foliage moisture sensor [10]
	ACCESSORIES
4712	Software with serial cable

WEATHER STATIONS CHAPTER 12

ANALOGUE WEATHER STATIONS

Outdoor weather station – Style

Displays humidity, air pressure and air temperature. This Style version is made of stainless steel and features blue displays. It comes complete with installation materials for wall mounting

TECHNICAL SPECIFICATIONS:

Material:	Stainless steel
Dimensions:	96 x 35 x 282 mm
Base unit:	ø 70/70/70 mm
Weight:	340 g

Art. No.	
4213	**Outdoor weather station – Style**

Outdoor weather station – Professional

Displays air humidity, air pressure and air temperature. Large stainless steel construction comes complete with installation materials for wall mounting.

TECHNICAL SPECIFICATIONS:

Material:	Stainless steel
Dimensions:	196 x 60 x 408 mm
Base unit:	ø 95/95/95 mm
Weight:	734 g

Art. No.	
4215	**Outdoor weather station – Professional**

Outdoor weather station – Compact

Displays humidity, air pressure and air temperature. The Compact version is made of aluminium/plastic and features a glass cover for wall mounting.

TECHNICAL SPECIFICATIONS:

Material:	Aluminium, plastic, glass
Dimensions:	146 x 70 x 216 mm
Weight:	461 g

Art. No.	
4227	**Outdoor weather station – Compact**

WIRELESS WEATHER STATION

Intelligent wireless weather station with forecasting index

Forecast system in text form with index, adjustable outdoor temperature alarm

Wireless weather station with up to max. three transmitter for temperature and humidity (max. 100m). completely new forecast system in text form with index for fog, snow, glazed frost, tempest and storm, forecast of the minimum night temperature, time and probability of forecast, transmission of outdoor temperature and humidity.

Indication of indoor temperature and humidity with comfort level, maximum and minimum values with time and date of recording (text form), symbols for actual weather and forecast, tendency of atmospheric pressure, atmospheric pressure with bar graph indication of the last 12 hours, outdoor temperature alarm , radio controlled clock with date. Adjustable outdoor temperature alarm (channel 1).

TECHNICAL SPECIFICATIONS:

Power supply:	Base unit: 3 x 1,5 V, AA size
	Transmitter: 2 x 1,5 V, AA size
Dimensions and Weight:	
	Base unit: 175 x 120 x 30 mm, 660 g
	Transmitter: 160 x 43 x 28 mm
Measuring range:	Indoor temperature: –10 °C to +60 °C
	Outdoor temperature:–40 °C to +60 °C
Humidity:	1 to 99 % rel. humidity
Resolution:	Temperature: 0,1 °C
Humidity:	1 % rel. humidity

Art. No.	
4222	**Intelligent wireless weather station with forecasting index**
	wireless weather station with one transmitter for temperature and humidity
4223	**Individual transmitter for temperature and humidity**

WEATHER STATIONS CHAPTER 12

WIRELESS WEATHER STATION

Wireless weather station with frost warning function

4255

4221

Measures temperature and air humidity

Wireless weather station with frost warning, consisting of weather station and radio-controlled clock. Weather forecast with animated icons for sunny, partly cloudy, cloudy, rainy and snow. Radio receiver for temperature data, transmitted from up to three sensors (indoors, outdoors, with max. unobstructed range of 30 m). Storage function for saving temperature and air humidity data. With frost warning: flashing LED when outdoor temperature is between 3°C and 2°C (only on channel 1).

TECHNICAL SPECIFICATIONS:

Power supply:	Base unit: three 1.5-V AA batteries
	Sensors: one 1.5-V AA battery
Dimensions and weight:	Base unit: 164 x 94 x 49 mm
Display range:	Indoor temperature: –5 °C to +50 °C
	Outdoor temperature: –20 °C to +60 °C
	Indoor air humidity: 25 to 95 % rel. humidity
Resolution:	Temperature: 0.1 °C
	Indoor air humidity: 1 % rel. humidity

Art. No.	
4221	**Wireless weather station with frost warning function**
	Wireless weather station and one wireless transmitter for temperature
4255	**Individual wireless transmitter for temperature**

MEASURING THE ILLUMINATION STRENGTH

Lux meter

The Lux meter is a high-precision digital light meter with three different measuring ranges. The sensor connects to the meter using a stretchable spiral cable which allows you to easily take precise point measurements.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 lx / 20,000 lx / 50,000 lx
Resolution:	1 lx, 10 lx, 100 lx
Precision:	±5 % +2 dig.
Display:	LCD display
Measurement time:	0.4 seconds
Sensor output voltage:	0.1 mV per 10 lx
Moisture range:	max. 80 % rel. humidity
Power supply:	One nine-volt battery, size A23
Run time:	approx. 200 hours
Dimensions and weight:	188 x 64.5 x 24.5 mm, 160 g

Art. No.

4050 **Lux meter** with light guide

Lux Multi

The professional Lux Multi measures four different forms of light: sun light, fluorescent lamp light, sodium-vapour lamp light and mercury-vapour lamp light. The meter features a min/max/average function, a hold function, and a zero-compensation function.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 lx / 20,000 lx / 100,000 lx
Resolution:	1 lx, 10 lx, 100 lx
Precision:	±5 % +2 dig.
Display:	LCD display
Operating temperature:	0 to +50 °C
Moisture range:	max. 80 % rel. humidity
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	180 x 72 x 23 mm, approx. 335 g

Art. No.

4054 **Lux Multi** with light guide

Lux-Mega

The Lux-Mega is a high-precision digital light meter that features five different measuring ranges. It can measure four different types of light: sun light, fluorescent lamp light, sodium-vapour lamp light and mercury-vapour lamp light. The meter also features a min/max/average display, a hold function, an RS232 interface and a zero-calibration function.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 40 lx / 400 lx / 4,000 lx / 40,000 lx / 400,000 lx
Degree of accuracy:	0.01 lx / 0.1 lx / 1 lx / 10 lx / 100 lx
Precision:	± (3 % +5 % MBE); < 100,000 lx
Display:	Liquid crystal display
Humidity range:	max. 80 %
Operating temperature:	0 to +50 °C
Power supply:	One 9-volt battery, 006P, MN1604 (PP3)
Dimensions and weight:	200 x 68 x 30 mm, 220 g

Art. No.

4080 **Lux-Mega** with light guide

MEASURING THE ILLUMINATION STRENGTH

Lux Quantum

For monitoring the photosynthetic radiation accessible to plants in wave lengths ranging from 400 to 700 λ. Since roofing material has a physiological influence on flower colour and plant growth, light monitoring plays a key role in managing the growth of indoor crops and plants.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 – 2,000 µmol/m²s (for λ: 400–700 nm)
Display:	LCD display
Operating temperature:	0 to +50 °C
Sensor output voltage:	0.1 mV per 10 lx
Power supply:	1 nine-volt battery, size 6LR61
Run time:	approx. 200 hours
Dimensions and weight:	150 x 75 x 25 mm, 130 g

Art. No.

4055 **Lux Quantum Meter** with light guide

PAR light collector

The DLI 100 Par light collector measures photosynthetically active radiation in the wavelength range of 400–700 nm (PAR) in µmol/m². It displays this measurement as photosynthetically active photon flux density in µmol/m²/s. It records all photosynthetically active radiation over a period of 24 hours (the daily light integral: DLI) in mol/m²/d. The DLI 100 has an LED display for displaying PAR and DLI.

TECHNICAL SPECIFICATIONS:

Measurement range:	PAR: 0 – 1,500 µmol/m²/s (for λ = 400–700 nm) DLI: 0–30 mol/m²/d (for λ = 400–700 nm)
Display:	4 LEDs
Measurement interval:	PAR: 20 s; DLI: 24 h
Power supply:	3-V battery
Dimensions and weight:	60 x 190 mm, 150 g

Art. No.

4087 **Light collector** with light guide

WIND GAUGE

Skywatch

Anemo-thermometer

Displays the current wind speed and temperature. Selectable wind speed in units of either km/h, mph, m/s, fps or knots. Temperature in °C or °F. Waterproof; with neoprene case and neck strap.

TECHNICAL SPECIFICATIONS:

Measurement range:	Wind speed: 0,7 to 108 km/h Temperature: –30 to +60 °C
Resolution:	Wind speed: 0.1 km/h Temperature: 0.1 °C
Precision:	Wind speed: ±5 % +/- 5% or +/- least significant digit
Dimensions and weight:	50 x 18 x 137 mm, 75 g

Art. No.

4240 **Wind gauge**

RAIN GAUGE

Hellmann

Prof. Hellmann rain gauge

An internal graduated cylinder is used to measure precipitation. It has a scale from 0 to 25 mm. This corresponds to the quantity of rain in litres that has fallen on a square meter of surface.

One mm of precipitation corresponds to a quantity of 1 litre/m².

Art. No.	
4110	**Prof. Hellmann rain gauge**
	ACCESSORIES
4150	Graduated cylinder insert

Wireless rain and temperature monitor

Rain monitor with wireless rain gauge

Wireless rain monitor for wireless transmission of rain quantity and temperature (max. 30 m range). The rain monitor empties itself automatically. The display shows the total rain quantity since the last reset, the rain quantity in the previous hour and previous 24 hours, and the last time of rain. A bar graph on the display shows rain over the last 7 days, weeks or months. There is also a temperature and rain alarm function with time/date.

TECHNICAL SPECIFICATIONS:

Measurement range:	Rain quantity: 0 to 9,999 mm
Indoor temperature:	–10 to +50 °C
Outdoor temperature:	–50 to +70 °C
Power supply:	3 or 2 1.5-Volt AA batteries
Dimensions and weight:	122 x 94 x 25 mm ø x h: 132 x 160 mm, 630 g

Art. No.	
4190	**Wireless rain monitor**

CUSTOM-PRINTED MARKETING ITEMS

Rain gauge

Printing: page 52

Plastic rain gauge with rain quantity scale in litres per m². Model with basket, pole fitting or rotary ring for keeping track of monthly rainfall levels.

Art. No.	
4011	**Rain gauge with pole fitting**
4203	**Rain gauge with rotating ring**
4204	**Rain gauge with basket**

SOIL MEASUREMENTS

SM150 soil moisture sensor

Measuring the volumetric soil moisture

The SM150 soil moisture sensor determines the volumetric soil moisture (m^3 water/m^3 of soil = Vol%). It operates based on the FDR (frequency domain reflectometer) principle. An electromagnetic field of 100 MHz is generated by the transmitting rod in the probe. The permeability of the soil field is then measured by the receiving rod. The permeability depends on the water content of the soil, the soil type and the amount of entrapped air. A measure of the permeability of this electromagnetic field is the relative permittivity. Since the relative permittivity of water is much greater than that of soil or air, the measurable change in the electromagnetic field is determined mainly by the soil moisture.
This type of measurement has a very low sensitivity to the salt content (salinity), temperature, and soil type. For more accurate measurements, it is possible to distinguish between mineral (sand, loam, or clay) soils and organic soils.

Measurements from the SSM 150 soil moisture sensor can be displayed using the HH150 portable analysis unit.
Data from multiple SSM 150 sensors can be recorded using the GP1 data logger and then imported to a PC. A maximum distance of 100 metres between the sensor and the data logger is possible. Irrigation can be controlled by taking advantage of the programmable relay output.

TECHNICAL SPECIFICATIONS:

Measurement range:	Soil moisture: 0 to 70 %
Degree of accuracy:	0.1%
Precision:	±3.0%
Salt error:	± 5% in the range of 1 to 10 mS/cm
Operating temperature:	–20 to +60 °C
Sample volume:	ø min. 70 mm, Depth: min. 55 mm
Power supply:	Two 1.5-V AAA batteries
Dimensions and weight	of SM150 ø 40 mm, length 143 mm, 0.1 kg

Art. No.		
8049	**HH150-KIT**	**545,00**
	Measurement kit for determining the volumetric soil moisture – consisting of the HH150 display unit (no storage memory), the SM150 probe and the portable case	
	ACCESSORIES	
8042	**SM150 soil moisture sensor**	
	for connecting to the HH150	
8039	**Tube extension, 100 cm**	
8038	**Tube extension, 50 cm**	
8048	**GP1 data logger**	
	Additional accessories are available on request	

SOIL MEASUREMENTS

BWK lance

Monitoring soil water

The BWK measures with a shielded, volumetric capacity-high-frequency technique whereby the water and soil volume density are both used to determine the soil moisture content. Because soil density can vary within a soil layer, a single measurement can only be used to indicate the moisture tendency. Multiple measurements at the same soil layer are necessary in order to calculate a meaningfully accurate value.

The temperature, pH value and salt content do not influence these measurements. The BWK lance delivers quick and simple results. It features a strong, sturdy lance made of stainless steel. The display shows customized colour scales for sand, loam and clay.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 100 %
Insertion depth:	max. 750 mm
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	320 x 920 x 145, 1.4 kg

Art. No.	
9000	**BWK lance**
	Aluminium housing, stainless steel probe with markings

MOISTURE ANALYSIS CHAPTER 15

SOIL MEASUREMENTS

Tensiometer

Analogue measurement of the suction tension

A tensiometer is used to measure suction tension. The porous cell of the tensiometer uses capillary action to transport water outwards into the drier soil. A negative pressure is then created within the closed pipe. This negative pressure is an indication of the moisture. Suction tension is a force measuring the tension with which the water is held to the soil or its availability. Plant roots must expend this force in order to absorb water. The decisive factors in creating this force are the fine pores and capillaries in the soil. This soil characteristic which the tensiometer measures is critical for plant growth. One advantage this instrument has over electrical meters is that it does not need to be calibrated.

The value of the suction tension increases as long as the substratum is capable of transferring the water and as long as the moisture differential is maintained. If the surroundings become more moist, the the process reverses itself. Close contact with the substrate is needed to get a quick tensiometer reaction and to get a value for certain soil and substratum types.

The tensiometer has a measuring range from 0 to 600 mbar negative pressure. It comes optionally with an analogue pressure manometer (the Tensiometer Classic) or with a digital pressure sensor (the Tensiometer Digital). Additional versions and lengths are available on request.

It is possible to connect to the EMS 323 event reporting system (page 41) by using the Tensio Trans transmitter or the Tensio Swith transmitter.

Art. No.	
	Tensiometer Classic
8059	Length: 20 cm
8060	Length: 30 cm
8061	Length: 60 cm
8062	Length: 100 cm
	Tensiometer Digital
8070	Length: 33 cm
8071	Length: 53 cm
	ACCESSORIES
8066	10 flat seals
8067	10 o-ring seals
8001	Manometer Tensiometer Classic
8075	Pressure sensor tensiometer digital
8080	Tensio Trans transmitter
8085	Tensio Swith transmitter

MOISTURE DATA LOGGER

Data logger

Measures the relative ambient humidity

Moisture and temperature logger with internal sensor (refer also to page 40).

TECHNICAL SPECIFICATIONS:

	Model 175-H1
Measurement range:	Temperature: –20 °C to +55 °C Air humidity: 0 to 100 % rel. humidity
Resolution:	Temperature: 0.1 °C Air humidity: 1 % rel. humidity
Precision:	Temperature: ±0.4 °C Air humidity: ± 2.0% rel. humidity +0,03%rF/K
Data storage capacity:	1 million measured values
Measuring interval range:	adjustable 10 s to 24 h
Operating temperature:	–20 °C to +55°C
Power supply:	3x AlMn Typ AAA
Run time:	approx. 3.0 years with a 15-min. measuring interval
Dimensions:	149 x 53 x 27 mm

Art. No.	
4320	**175-H1 data logger**
4323	**Software at USB stick**

MEASUREMENTS IN BULK SOLIDS

Insertion hygrometer

Measuring the relative humidity

The insertion hygrometer is mainly used for agricultural applications. It is used, for example, to determine the humidity when working with grain crops. The hygrometer can be put anywhere and positioned either horizontally, vertically or tilted diagonally. Specification charts are available for: cotton, grass seeds, hay, wood, corn, rapeseed, rice, a variety of grains, and more.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 100 % rel. humidity
Housing:	Stainless steel 1.4301
Sleeve:	Stainless steel 1.4301
Hand grip:	Screw-in, brass
Probe diameter and length:	23 mm, 500 mm
Operating temperatures:	up to 80 °C, short-term up to 120 °C
Measuring system:	Hygro element
Quality category:	2.5

Art. No.	
9100	**Insertion hygrometer** Probe length: max. 1 m, other lengths available on request

MEASUREMENTS ON SOLID OBJECTS

Material moisture meter

Measures moisture in wood and construction material

This meter is ideal for monitoring construction material moisture levels directly at the construction site. Its speedy and reliable – just take off the cap and stick the measurement electrode in the object being measured. The meter has a measurement scale specifically for wood and construction materials. It also features an automatic test function.

TECHNICAL SPECIFICATIONS:

Measurement range:	Wood: 6 to 44 % Construction materials: 0.2 to 2.0 %
Precision:	Wood: ±1 % Construction materials: ±0.05 %
Measurement technique:	Electrical resistance
Electrode length:	8 mm
Battery:	Three 1.5-volt batteries, size CR2032
Dimensions and weight:	130 x 40 x 21 mm, approx. 100 g

Art. No.	
9150	**Material moisture meter** with bag and mounting clip

MOISTURE ANALYSIS CHAPTER 15

AMBIENT MEASUREMENTS

Hygrometer with indoor/ outdoor thermometers

Measuring air humidity and temperature

Wall hygrometer with indoor/outdoor thermometers and minimum/maximum feature. All values can be displayed at the press of a button. The external temperature sensor is about 3 m long. The display can switch between °C and °F.

TECHNICAL SPECIFICATIONS:

Measurement range:	Indoor temperature –10 to +50 °C Outdoor temperature: –50 to +70 °C Air humidity: 25 % to 98 % rel. humidity
Power supply:	One 1.5-Volt, AA size battery

Art. No.	
4025	**Hygrometer with indoor/ outdoor thermometers**

Pocket hygrometer with thermometer

Measures air humidity and temperature

This pocket meter measures temperature and humidity. It saves the minimum and maximum temperature and humidity values. It features a fast-update display and is suitable for use in refrigerated warehouses, greenhouses, etc. It can display in either °C or °F.

TECHNICAL SPECIFICATIONS:

Measurement range:	Temperature: –20 to +50 °C Air humidity: 10 % to 95 % rel. humidity
Resolution:	Temperature: 0.1 °C Air humidity: 1 %
Precision:	Temperature: ±1 °C Air humidity: ±5 % for 30 to 80 % rel. humidity otherwise 7 %
Dimensions and weight:	150 x 20 x 16 mm, 40 g

Art. No.	
4027	**Pocket hygrometer with thermometer**

High-precision hair hygrometer

Measuring air humidity

This highly precise hair hygrometer measures the relative air humidity. The instrument features a silver-coloured, chrome-steel housing. It has an easy-to-read diameter of 103 mm and is ranked "very good" by the Stiftung Warentest, a leading German consumer testing association.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 100 % rel. humidity
Scale divisions:	1 % rel. humidity
Precision:	±3 %
Operating temperature:	–35 to +65 °C
Dimensions and weight:	ø 103 mm, 80 g

Art. No.	
4033	**High-precision hair hygrometer**

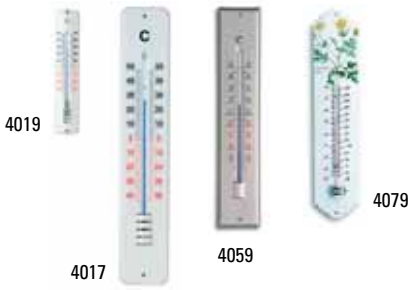
ANALOGUE THERMOMETER

Min/max thermometer

Min/max thermometer with easy-to-read scale, in aluminium or plastic. Measurement range from –38 to +50 °C. Mercury free.

Art. No.	
4070	**Min/max thermometer**
	Black scale, 220 x 60 mm, 150 g
4010-G 4010-W	**Min/max thermometer**
	230 x 79 mm, 120 g, green (G) or white (W)

Gardener thermometer



The metal gardener thermometer comes with an easy-to-read scale in a variety of sizes. Measurement range from –40 to +50 °C or –35 to +65°C (4079).

Art. No.	
4019	**Gardener thermometer**
	205 mm x 40 mm, 60 g, white
4059	**Gardener thermometer**
	280 mm x 58 mm, 150 g, silver
4017	**Gardener thermometerr**
	450 mm x 80 mm, 130 g, white
4079	**Enamel thermometer**
	up to 65°, 290 mm x 63 mm, 170 g, floral design

Insertion thermometer

Waterproof (splash water) insertable bi-metal thermometer with stainless steel measuring rod and rod holder.

TECHNICAL SPECIFICATIONS:

Display:	–20 °C to +100 °C, ø 25 mm
Measuring rod:	120 mm, ø 3.8 mm

Art. No.	
4225	**Insertion thermometer**

TEMPERATURE MEASURING SYSTEMS CHAPTER 16

ANALOGUE THERMOMETER

Plastic thermometer

Art. No.	
4083	**Plastic thermometer**
	26 x 9 x180 mm, 12 g, -30 to +50°, white
4084	**Cooler thermometer**
	ø 13 mm x 45 mm, 10 g, -30 to +30°

Plastic soil thermometer

Soil thermometer for taking inexpensive measurements of the soil temperature

Art. No.	
4086	**Soil thermometer**
	29 x 22 x 322 mm, 63 g, -5 to +80°

Frost monitor

Contact thermometer

High-precision fixed-contact thermometers are well suited for monitoring a specific temperature range in horticulture, agriculture and fruit crops. They feature a permanent fused-on contact and a plug-in connection. The plug connection allows you to swap thermometers at any time. A relay is used to connect to an alarm transmitter which can then send alerts to the operator. The units are manufactured depending on the specific switching temperature required for the application.

A range of up to 2000 metres can be obtained when using Liycy cables (2 x 0.5 mm²) or PVC control cables.

Art. No.	
4082	**Fixed-contact thermometer** (Please specify temperature when ordering)

ANALOGUE THERMOMETER

Compost thermometer

Bi-metal thermometer for depth measurements

Bi-metal thermometer for long-term stationary measurements in compost or piles. Designed with measurement probe and handles.

Other measurement ranges and lengths (up to 4 m) are available on request.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to +120 °C
Precision:	Class 1 (1 %)
Display:	ø 80 mm
Measuring rod:	ø 13 mm

Art. No.	
4051	**Compost thermometer: 0.5 m** 0 to +120°C
4006	**Compost thermometer: 1.0 m** 0 to +120°C
4007	**Compost thermometer: 1.5 m** 0 to +120°C
4078	**Compost thermometer: 2.0 m** 0 to +120°C
4081	**Compost thermometer: 2.5 m** 0 to +120°C

Bi-metal thermometer

Bi-metal thermometer for ground and vapour measurements

Bi-metal thermometer for long-term stationary soil measurements from –20 to +60 °C. Extende temperature range (from 0 to +120 °C for vapour measurements) also possible. Featuring a stainless steel measuring rod ø 6 mm and display ø 50 mm. Other measurement ranges and lengths are available on request.

TECHNICAL SPECIFICATIONS:

	Soil thermometer
Measurement range:	–20 to +60 °C
Display:	ø 50 mm
Measuring rod:	ø 6 mm
Material:	Stainless steel measuring rod Measuring head made from glass and steel
	Vapour thermometer
Measurement range:	0 to +120 °C
Display:	ø 50 mm
Measuring rod:	ø 6 mm
Material:	Stainless steel measuring rod Measuring head made from glass and steel

Art. No.	
4001	**Soil thermometer: 200 mm** -20 to +60°C
4002	**Soil thermometer: 300 mm** -20 to +60°C
4004	**Soil thermometer: 500 mm** -20 to +60°C
4016	**Vapour thermometer: 300 mm** 0 to +120°C
4005	**Vapour thermometer: 500 mm** 0 to +120°C

Stainless steel thermometer

Bi-metal stainless steel thermometer with large display

High-precision bi-metal stainless steel thermometer for long-term stationary soil measurements from –20 to +60°C. Extended temperature range (from 0 to 120°C for vapour measurements) also possible. Featuring a stainless steel measuring rod (ø 6 mm) and display (ø 63 mm).

Other measurement ranges and lengths are available on request.

TECHNICAL SPECIFICATIONS:

	Soil thermometer
Measurement range:	–20 to +60°C
Precision:	Class 1 (1%)
Display:	ø 63 mm
Measuring rod:	ø 6 mm
Material:	Stainless steel measuring rod Measuring head made from glass and stainless steel
	Vapour thermometer
Measurement range:	0 to +120°C
Precision:	Class 1 (1%)
Display:	ø 63 mm
Measuring rod:	ø 6 mm
Material:	Stainless steel measuring rod Measuring head made from glass and stainless steel

Art. No.	
4206	**Soil thermometer: 300 mm** -20 to +60°C
4208	**Soil thermometer: 500 mm** -20 to +60°C
4242	**Vapour thermometer: 300 mm** 0 to +120°C
4243	**Vapour thermometer: 500 mm** 0 to +120°C

DIGITAL THERMOMETER

Min/max thermometer

Measures the indoor and outdoor temperature

This wall thermometer with min/max function can simultaneously display the time and indoor and outdoor temperatures. All values can be displayed at the press of a button. The external temperature sensor is about 3 m long. The display can switch between °C and °F.

TECHNICAL SPECIFICATIONS:

Measurement range:	Indoor temperature: –10 to +50 °C
	Outdoor temperature: –50 to +60 °C
Power supply:	One 1.5-Volt, AA battery

Art. No.	
4022	**Min/max thermometer** with indoor and outdoor thermometers

Digital thermometer

Measures with insertion probe

Waterproof, digital all-purpose thermometer with insertion probe and approx. 60 cm cable. With table stand and mounting clip. Max/min and hold functionality. Switchable between °C and °F.

TECHNICAL SPECIFICATIONS:

Measurement range	–40 to +200 °C
Resolution:	0.1 °C
Precision:	±1 °C
Protection class:	IP65
Dimensions and weight:	95 x 60 x 18 mm (without probe), 130 g

Art. No.	
4024	**Digital thermometer with insertion probe**

Digital thermometer

Measures with insertion probe

This quick, insertable digital thermometer with min/max function comes with a protective sheath and clip.

TECHNICAL SPECIFICATIONS:

Measurement range:	–50 to +150 °C
Precision:	±1 %
Resolution:	0.1 °C
Power supply:	One 1.5-Volt, "393" size
Dimensions and weight	195 x 20 mm, 24 g

Art. No.	
4058	**Quick digital thermometer**

TEMPERATURE MEASURING SYSTEMS CHAPTER 16

DIGITAL THERMOMETER

Miniflash

Infrared thermometer

Non-contact infrared thermometer with min/max save function. Switchable between °C and °F. With automatic hold and lock functions enabling long-term operations. Perfect for measuring foliage and leaf surface temperatures.

TECHNICAL SPECIFICATIONS:

Measurement range:	–33 to +220 °C
Resolution:	0.1 °C
Precision:	±1.5 °C (0 to +50 °C otherwise 2 %)
Emissions ratio:	0.95, static
Optical resolution:	1,3 : 1
Power supply:	CR2032 button cell
Dimensions and weight:	68 x 37 x 18 mm, 25 g

Art. No.	
4286	**Miniflash**

Laser thermometer

Laser infrared thermometer

Non-contact infrared thermometer with laser sight, large backlit LCD and quick response time.

TECHNICAL SPECIFICATIONS:

Measurement range:	Infrared: –33 to +500 °C
	External thermocouple (NiCr-Ni): –64 to +1,400 °C
Resolution:	0.1 °C (1 °C from +200 °C)
Precision:	Infrared: ±2 °C or ±2 % *
	Thermocouple: ±1 °C or ±1 % *
	(* the larger of the two values is valid)
Emissions ratio:	adjustable 0.10 to 1.00
Optical resolution:	11 : 1
Power supply:	Two 1.5-V AAA batteries
Run time:	approx. 140 hours
Dimensions and weight:	39 x 175 x 80 mm, 180 g

Art. No.	
4285	**Laser thermometer**

Wireless thermometer

Wireless thermometer with up to three transmitters and wireless clock

Wireless thermometer with max. three temperature sensors. Saves min/max temperature. Temperature alarm function for each channel. Range of approx. 30 m. External sensor is protected against splashed water.

TECHNICAL SPECIFICATIONS:

Measurement range:	Indoor temperature: –5 to +50 °C
	Outdoor temperature: –30 to +60 °C
Resolution:	0.1 °C
Power supply:	Indoor temp.: two 1.5-V AAA batteries
	Outdoor temp.: one 1.5-V AA battery
Dimensions and weight:	Indoor temp.: 118 x 93 x 52 mm, 179 g
	Outdoor temp.: 96 x 50 x 22 mm, 62 g

Art. No.	
4250	**Wireless thermometer, one transmitter**
4255	**Individual wireless transmitter for temperature**

DIGITAL THERMOMETER WITH EXTERNAL SENSORS

Temperature probes

Temperature probes with NiCr-Ni component

The stainless steel temperature probe with NiCr-Ni component is available for a variety of applications in a range of lengths. The 4009, 4020 and 4030 models of the probes are perfect for composting applications. Customer-specific versions are also available (for example, with a second temperature sensor for simultaneous probe measurements at 1 metre and 2 metre depths). Smaller probes are available for laboratory applications, cultivation systems or surface measurements.

An optional connection to the EMS 323 event reporting system (page 41) for a temperature transmitter is also available.

TECHNICAL SPECIFICATIONS:

	4009, 4020, 4030
Measurement range:	-20 to +105 °C
Thermocouple:	Type K, class 1
Connection length:	45 cm, or approx. 1.7 m stretched

Art. No.	
4009	Temperature probe ø 12 mm, 1,000 mm
4020	Temperature probe ø 12 mm, 1,500 mm
4030	Temperature probe ø 12 mm, approx. 2,000 mm
4032	Extra charge for additional temperature sensors
4053	Temperature cable probe ø 1 mm, welded with approx. 1m cable
4052	Temperature probe ø 3 mm, 80 mm
4008	Temperature probe ø 3 mm, 120 mm
4915	Temperature transmitter Type K, for connecting to EMS

TEMPERATURE MEASURING SYSTEMS CHAPTER 16

DIGITAL THERMOMETER WITH EXTERNAL SENSORS

Digital thermometer

Digital thermometer for two sensors

Digital thermometer with LCD display suitable for two external temperature probes. This quick and affordable instrument for displaying measurements is suitable for many applications.

TECHNICAL SPECIFICATIONS:

Measurement range:	–40 to +1,200 °C
Resolution:	1 °C
Precision:	±1 % +1 °C (0 to +750 °C)
Display:	LCD display
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	108 x 73 x 23 mm, 140 g

Art. No.	
4018	Digital thermometer for two sensors

Digital thermometer with calibration certificate

Digital thermometer for precise measurements

This simple, precise thermometer is particularly sturdy and easy to use. It features a min/max function, a hold function, an RS232 port, and a 16-measurement memory. You can also use the single-point calibration feature to adjust the measurement values.

TECHNICAL SPECIFICATIONS:

Measurement range:	–99.9 to +1,370 °C
Resolution:	0.1 °C (to 399.9 °C), otherwise 1 °C
Precision:	±0.5 °C
Display:	LCD display
Power supply:	Two 1.5-Volt, AA size batteries
Run time:	approx. 200 hours
Dimensions and weight:	130 x 65 x 25 mm, 240 g

Art. No.	
4023	Digital thermometer for precise measurements
	ACCESSORIES
4075	Software

Digital thermometer

Digital thermometer with wireless option

Quick temperature probes can be connected to this single-channel thermometer. Wireless (cable-free) transmission of measurement allows you to display an additional temperature probe on the unit. An acoustic alarm is triggered when limit values are exceeded. The current measurements and the min/max values can be printed on site with the log printer.

TECHNICAL SPECIFICATIONS:

Measurement range:	–50 °C to +1,000 °C
Resolution:	0.1 °C (to 199.9 °C), otherwise 1 °C
Precision:	±(0.5 °C +0.3 %)
Display:	two-character LCD display
Power supply:	One 9-V 6F22 size battery
Run time:	approx. 200 hours
Dimensions and weight:	182 x 64 x 40 mm, 171 g

Art. No.	
4021	Digital thermometer with wireless option
	ACCESSORIES
4034	TOP-SAFE protects against dirt and impact
	Wireless probe, log printer available on request

Data logger

4330

4310

4311

4335

Compact data logger

Data logger for temperature (T1, T3 and T4) and humidity (H1, see.: humidity analysis page 35) for reliable measurement, storage and data documentation functionality. The 175/176 series of compact data loggers are suitable for measuring temperature and relative humidity. They are capable of storing up to 2 mio. measured values.

In addition to the current values, the one-row display shows the min/max values and the specified limit values. Measurement data is not lost when the battery is empty or being replaced. Thus data loss is practically impossible. The data loggers have a USB and a SD card interface, making readout of the data fast and easy. The considerably higher memory capacity and the power supply using conventional batteries are further plus points of the new generation. It goes without saying that the proven one-button menue structure, wich offers absolute operating convenience, has been retained in the new version of the data loggers. These data loggers are suitable for simple and affordable temperature monitoring applications. They are ideal for use in greenhouses, refrigerator transport, refrigerated storage, in display cabinet, or for room monitoring.

The model 175-T3 (4311) – for monitoring compost temperatures – has been recommended by the German Community Composting Organization because it encourages hygienic compost techniques. Required accessory: temperature probe with length of 8, 12, 100, 150 or 200 cm (catalogue page 39, art. no. 4052, 4008, 4009, 4020, 4030). Different models are available depending on the type and number of measurement locations. Application software (for Windows 95, 98, 2000, NT, ME and XP) is optionally available for exporting, displaying (with table and charts), printing and programming data.

Mini temperature data logger

The T174 mini temperature data logger is perfect for taking with you on the road. Simply place the logger with your goods or material (for example, in an airplane, container or refrigerator room) and it will continually and inconspicuously monitor for temperature deviations. It features a high level of data integrity (even with empty battery) and a large display for the current temperature.

Easy readout of the data and transport to the PC via USB interface.

Software for the data logger

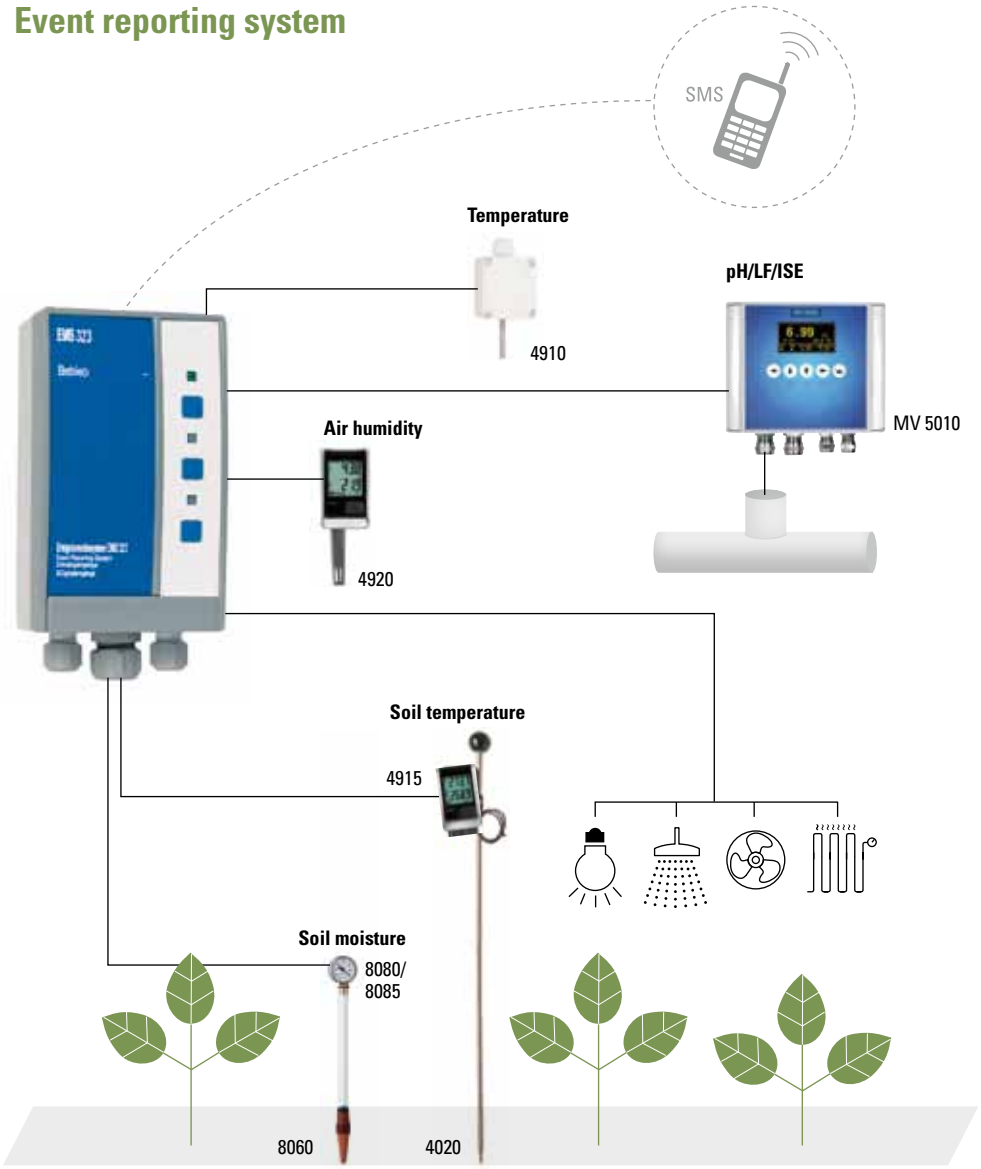
Windows software for the data logger: for data analysis and PC-based device reprogramming with new graphic user interface. Convenient export functions, e. g. for further processing of the data in Microsoft Excel, or the generation of a PDF. The software will be delivered on a USB-stick.

TECHNICAL SPECIFICATIONS:

Affordable single-channel temperature logger with internal sensor: Model 175-T1	
Measurement range:	–35 to +55 °C
Resolution:	0.1 °C
Precision:	±0.5 °C from –20 to +55 °C
Data storage capacity:	1 mio. values
Measuring interval range:	adjustable 10 s to 24 h
Operating temperature:	–35 °C to +55 °C
Power supply:	3x AlMn Typ AAA
Run time: approx. 3 years with a 15-min. measuring interval	
Protection class:	IP65
Dimensions:	89 x 53 x 27 mm
Dual-channel temperature logger with 2 external probes (NiCr-Ni): Model 175-T3	
Measurement range:	–50 to +1,000 °C
Resolution:	0.1 °C
Precision:	±0.5 °C (–50 to +70 °C) ±0.7 % (70.1 to + 1,000°C)
Data storage capacity:	1 mio. values
Measuring interval range:	adjustable 10 s to 24 h
Operating temperature:	–35 °C to +55 °C
Power supply:	3x AlMn Typ AAA
Run time: approx. 3 years with a 15-min. measuring interval	
Protection class:	IP65
Dimensions:	89 x 53 x 27 mm
Four-channel temperature logger with 4 external probes (NiCr-Ni): Model 176-T4	
Measurement range:	–195 to +1,000 °C
Resolution:	0.1 °C
Precision: **±1 digit**	±0.5 % (+70.1 to +1,000 °C) ±1 % (–200 to –100.1 °C) ±0.3 °C (–100 to +70 °C)
Measurement storage:	2 mio. values
Measurement intervals:	1 s to 24 h
Operating temperature:	–20 to +70 °C
Power supply:	One 3.6-V AA battery
Run time:	8 years with 15-min measurement interval
Protection class:	IP54
Dimensions:	103 x 63 x 33 mm
Mini data logger	
Measurement range:	–30 to +70 °C
Resolution:	0.1 °C
Precision:	±0.5 °C (–30 bis +70 °C)
Measurement storage:	16,000 values
Measurement intervals:	adjustable from 1 min to 24 hours
Operating temperature:	–30 to +70 °C
Power supply:	2 x 3-volt button cell, size CR2032
Run time:	500 days (typical)
Protection class:	IP65
Dimensions:	60 x 38 x 18.5 mm

Art. No.	
4330	**175-T1 data logger**
4310	**175-T3 data logger**
4311	**176-T4 data logger**
4335	**T174 mini data logger with wall mount**
	ACCESSORIES
4343	Spare battery for the 175-T1 (4330), -T2 (4309), 177 (4311) and 176 (4311-N)
4345	Spare battery for the 175-H2 (4320), -T3 (4310)
4348	1 x 1,5 Volt, type AAA for 175-H1 (4320-N), 175-T1 (4330-N) and 175-T3 (4310-N), order three pieces
4333	Spare battery for the T174 (4335) CR2032 size
4323	Software at USB-Stick

Event reporting system



Art. No.	
4900	**Event reporting system**
	ACCESSORIES
4910	Room temperature sensor
4920	Humidity sensor
4925	Humidity/temperature sensor
8080	Tensio Trans transmitter for connecting to Tensiometer (refer to p. 34)
8085	Tensio Swith transmitter for connecting to Tensiometer (refer to p. 34)
4915	Temperature transmitter for connecting to soil/temperature probe (refer to p. 39)
4916	LF transmitter for connecting to conductivity electrode
4917	pH transmitter for connecting to pH probe

EMS 323 event reporting system:
production control using your mobile phone

The EMS 323 event reporting system is a remote monitoring system that can be used for monitoring and controlling your horticultural production sites. Up to three analogue signals (4 to 20 mA) and two digital signals (such as room temperature, air humidity, soil moisture, pH, EC, etc.) can be monitored with one device. If any of the measured values change or exceed the pre-defined min/max values, then a message is sent to the specified telephone, fax numbers or e-mail addresses.

Up to 12 phone numbers, 4 fax numbers or 4 e-mail addresses can be assigned and saved. The EMS 323's GSM quadband functionality allows you to control and view the status of measuring devices and horticultural production facilities worldwide regardless of your location. The GSM M2M (machine-to-machine) technology enables SWITCHING, RECEIVING and MEASURING via SMS or telephone call.

The devices can be programmed using the supplied configuration software. All parameters (measurement intervals, limits, data transmission intervals, etc.) can easily be set over the integrated USB-A interface (e.g. using a laptop). The operator can also change parameters any time using a mobile phone. The EMS 323 requires a conventional, activated SIM card from any network provider.

TECHNICAL SPECIFICATIONS:

	Temperature range
Ambient surroundings:	–20 to +60°C
Power supply:	230 VAC
Power supply for sensor:	24 VDC
Alarm inputs:	3 analogue inputs: 4 to 20 mA 2 digital inputs, connected potential-free
Data transfer:	GSM short message (SMS) with integrated GSM modem
Frequency ranges:	GSM quadband 850/900/1,800/1,900 MHz
Switching outputs:	Relay contacts: 3 potential-free changeover contacts: 250 V AC, max. 5 A
Housing:	Wall-mounted housing made from impact-resistant plastic (ABS) 100 x 188 x 65 mm
Protection degree:	IP40 (EN 60529)

MAGNIFIERS

Thread-counting magnifiers

4410/4411

4421

4419

TECHNICAL SPECIFICATIONS:

Magnification:	12-x / 8-x / 9-x / 6-x
Aperture:	10 x 10 mm / 20 x 20 mm / 10 x 10 mm / 25 x 25 mm
Housing:	aluminium
Height:	23 mm / 39 mm / 30 mm
Scale:	1 mm (4421)

Art. No.	
4410	**Thread-counting foldable magnifier** 12-x
4411	**Thread-counting foldable magnifier** 8-x
4421	**Thread-counting foldable magnifier with scale** 9-x
4419	**Thread-counting magnifier with needle gauge** 6-x

High-precision folding magnifier

TECHNICAL SPECIFICATIONS:

Magnification:	6-x / 10-x / 15-x
Diameter ø:	22.8 mm
Lens:	Aplanatic silicate glass lenses
Housing:	Stainless steel
Frame:	Black plastic

Art. No.	
4412	**High-precision folding magnifier** 6-x
4413	**High-precision folding magnifier** 10-x
4414	**High-precision folding magnifier** 15-x
4415	**Black leather pouch**

MAGNIFIERS AND MICROSCOPES CHAPTER 18

MAGNIFIERS

Illuminated magnifier

TECHNICAL SPECIFICATIONS:

Magnification:	10-x
Lens:	With anti-static coating
Diameter (ø):	30 mm
Housing:	Plastic
Battery:	Three 1.5-V AAA battery

Art. No.	
4420	**Illuminated magnifier with pouch**

MICROSCOPES

Baton microscope

TECHNICAL SPECIFICATIONS:

Magnification:	40-x
Lens:	Coated high-precision lens
Battery:	Two 1.5-V AA battery

Art. No.	
4430	**Baton microscope with illumination**

USB microscope

Microscope with display on computer screen, for recording digital photos and brief videos. With six LEDs for illumination.

TECHNICAL SPECIFICATIONS:

Magnification:	10x – 40x / 150x
Lens:	1,600 x 18,000 pixels
Camera snap scans:	Snap scan up to 5 MP, with interpolation and video
Communication:	USB 2.0 with power supply
Hardware:	Windows XP, Vista and Windows 7
Dimensions and weight:	108 x 132 cm, 113 g

Art. No.	
4417	**USB microscope** Camera, stand, CD, USB cable

SOIL MEASUREMENTS

Penetrometer

Determining the soil density

The penetrometer is used to precisely determine the soil density. The stainless steel probe is scaled to mark the soil depth. The display features an easy-to-read colour scale.

Plants living in dense soils can only absorb a limited amount of water and nutrients. Densely compacted soil also restricts the air exchange in the soil and reduces the N-mineralization.

This simple and sturdy hand penetrometer can measure the penetration resistance in soil. It is held vertically and then pressed into the soil with an even pressure on both hand grips. The easy-to-read colour display then shows the pounds per square inch analogue reading. The penetrometer is used in agriculture or sport/golf maintenance applications for detecting compacted layers of soil. This allows you to perform generalized pedological tests and basic foundation surveys (for determining the carrying capacity). You can also examine the expected growth conditions for plants and trees.

The penetrometer is delivered with two cone-shaped tips. The small cone (with the smaller surface) is used for solidly packed soils while the large cone (with the larger surface) is used for softer soils. There are two displays corresponding to the type of cone being used which are calibrated based on the cone's surface area.

TECHNICAL SPECIFICATIONS:

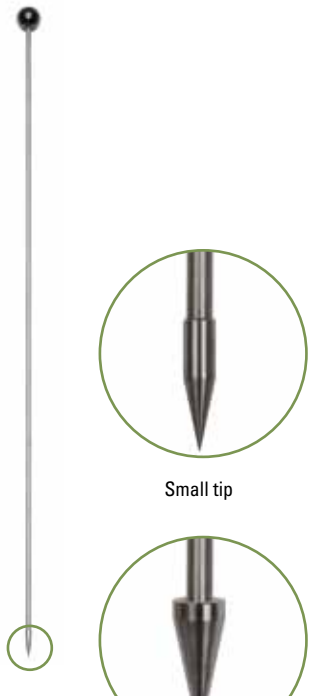
Measurement range:	0 to 3,500 kPa
Divisions:	10 cm
Penetration depth:max.	max. 80 cm

Art. No.	
5090	**Penetrometer** with 2 tips

SOIL DENSITY CHAPTER 19

SOIL MEASUREMENTS

Soil probe



Small tip

Large tip

Detecting compacted soil layer and compacted areas left by ploughs

The stainless steel soil probe is a tool used for detecting (or probing) soil layer densities, water permeability levels, and soil types. It does not require the soil to be dug up. It can be used to detect zones within the topsoil layer which may disturb root growth (too loose or too dense soil) or to find compression zone caused by ploughs or tractors. It is also useful for detecting differences in soil types in the soil zone (for example, loess on clay or peat on sand).
In addition, the soil probe can be used for tree care applications.

The soil probe is delivered with two cone-shaped tips. The cones have different surface areas; this allows you to measure in both compacted and loose soils.

TECHNICAL SPECIFICATIONS:

Measurement range:	1,000 mm
Marking scale:	every 100 mm
Dimensions and weight:	ø 8 x 1,150 mm, approx. 450 g

Art. No.	
5030	**Soil probe** with 2 tips
	ACCESSORIES
5031	Small tip
5032	Large tip

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Sampling auger for pots

Sampling auger suitable for pots, container plants, smaller plant vessels and floriculture. Volume sampling auger, with scale, for removal of defined soil samples for purposes of NPK measurement (refer to page 19).

TECHNICAL SPECIFICATIONS:

Total length, tube length:	350, 200 mm
Outer tube, inner tube ø:	16, 10 mm
Ball handle ø:	30 mm
Weight:	0.185 kg
Classification: (only 5001)	10 ml

Art. No.	
5000	**Sampling auger for pots**
5001	**Volume sampling auger** with scale

Hand-held sampling auger

Hand-held auger with closed tube tip suitable for potted or containerized plants, floriculture, tree nurseries, and heavily root-bound plants.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	350, 210 mm
Outer tube, inner tube ø:	20, 17 mm
Ball handle ø:	50 mm
Weight:	0.32 kg

Art. No.	
5002	**Hand-held sampling auger**

Sampling auger

For all-purpose use with solid-built slim grip. Designed for the nitrate kit. Suitable for intensive-use glass-covered crops in natural soils and outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	460, 300 mm
Outer tube, inner tube ø:	20, 14 mm

Art. No.	
5004	**Sampling auger**

SOIL SAMPLING AUGER CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Sampling auger

All-purpose sampling auger with solid-built wide grip. Suitable for glass-covered crops in natural soils and outdoor areas.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	560, 300 mm
Outer tube, inner tube ø:	17, 11 mm
Weight:	0.55 kg

Art. No.	
5003	**Sampling auger, solid build**

Sampling auger with foot rest

Auger with foot rest for outdoor crops with dense root zones. Solid-built handle and foot rest.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	810, 300 mm
Outer tube, inner tube ø:	20, 14 mm
Weight:	1.5 kg

Art. No.	
5006	**Solid-built sampling auger with foot rest**

Sampling auger with foot rest

Auger with foot rest and extra-short tube – custom designed for grass and golfing applications. Solid-built grip and foot rest.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	810, 100 mm
Outer tube, inner tube ø:	20, 14 mm
Weight:	1.5 kg

Art. No.	
5007	**Sampling auger with foot rest**

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Standard type 60

Standard sampling auger for light soils.
With solid grip and 300-mm divisions.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	810, 600 mm
Outer tube, inner tubeø:	22, 15 mm
Weight:	1.25 kg

Art. No.	
5010	Standard type 60

Stripper for dislodging soil probes

Suitable for all sampling augers
except for the sampling auger for pots (art. no. 5000)

Art. No.	
5099	Stripper for dislodging soil probes

Puller for the Pürckhauer

Puller mechanism that latches onto the Pürckhauer. The Pürckhauer is then pulled out of the earth with a pumping motion.

TECHNICAL SPECIFICATIONS:

Stroke height:	750 mm
Stroke load:	350 kg
Weight:	2.3 kg

Art. No.	
5600	Puller for the Pürckhauer

SOIL SAMPLING AUGER CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Type-60 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Features a slim design and light weight, with 10-cm divisions. Use for outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	1,000, 600 mm
Outer tube, inner tube ø:	25, 20 mm
Reinforced strike head, ø:	38 mm
Weight:	2.9 kg

Art. No.	
5011	Type-60 Pürckhauer

Type-60 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Features a short design and light weight, with 10-cm divisions. Use for outdoor vegetables.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	810, 600 mm
Outer tube, inner tube ø:	20, 13 mm
Strike head ø:	34 mm
Weight:	2.4 kg

Art. No.	
5012	Type-60 Pürckhauer
5112	Spare auger grip for the 5012

Type-90 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Mid-sized design, with 10-cm divisions, for all-purpose use.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	1,050, 900 mm
Outer tube, inner tube ø:	25, 17 mm
Reinforced strike head ø:	38 mm
Weight:	3.5 kg

Art. No.	
5014	Type-90 Pürckhauer

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Type-100 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Total-cylinder design for pebbly soils, with conical tip. Extra strong auger for garden work. With 10-cm divisions.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	1,175, 1,000 mm
Outer tube, inner tube ø:	28, 18 mm
Reinforced strike head ø:	38 mm
Weight:	4.0 kg

Art. No.	
5016	Type-100 Pürckhauer

Type-100 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Total-cylinder design made from steel tube for light, sandy soils. With 10-cm divisions.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	1,170, 1,000 mm
Outer tube, inner tube ø:	30, 24 mm
Reinforced strike head ø:	38 mm
Weight:	3.5 kg

Art. No.	
5017	Type-100 Pürckhauer

Type-100 Pürckhauer

Attachable auger grip with rubber sheathing and notch for removing soil samples. Solid-built with 60-cm tapered cone shape. For heavy, compacted soils containing clay. Extra strong construction. With 10-cm divisions.

TECHNICAL SPECIFICATIONS:

Total length, tube length:	1,175, 1,000 mm
Outer ø:	top: 28 mm, bottom: 25 mm
Inner tube ø:	18 mm
Reinforced strike head ø:	38 mm
Weight:	3.8 kg

Art. No.	
5018	Type-100 Pürckhauer

SOIL SAMPLING AUGER CHAPTER 20

SLEDGE HAMMERS

Simple sledge hammer

Type-I Simplex sledge hammer:	
Hammer length:	1,050 mm
Weight:	7 kg
Striking surface ø:	125 mm
Head length:	215 mm

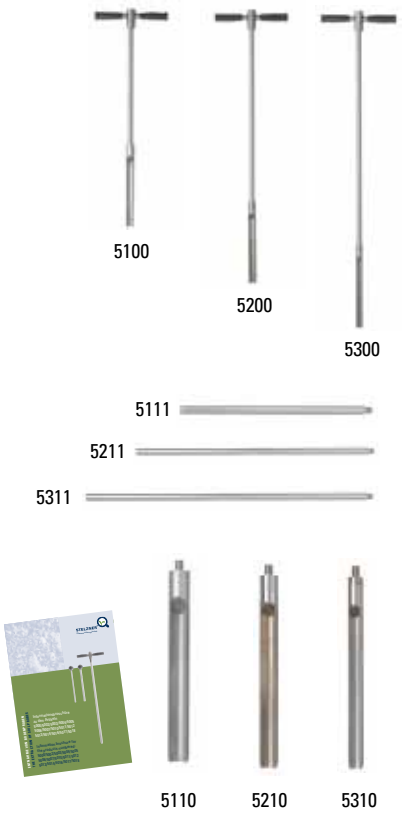
Type-II Simplex sledge hammer	
Hammer length:	1,000 mm
Weight:	5 kg
Striking surface ø:	100 mm
Head length:	200 mm

Type-III Simplex sledge hammer	
Hammer length:	800 mm
Weight:	3 kg
Striking surface ø:	80 mm
Head length:	105 mm

Art. No.		
5021	Type-I Simplex sledge hammer	
5022	Type-II Simplex sledge hammer	
5023	Type-III Simplex sledge hammer	
	ACCESSORIES	
5024	Plastic insert pairs for the 5021	
5025	Plastic insert pairs for the 5022	
5026	Plastic insert pairs for the 5023	
5027	Hickory handle for the 5021: 900 mm	
5028	Hickory handle for the 5022: 900 mm	
5029	Hickory handle for the 5023: 700 mm	
5050	Special tool	
5051	Cast handle for the 5021	
5052	Cast handle for the 5022	
5053	Cast handle for the 5023	

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Multi-piece boring kits



Multi-piece boring kits / boring apparatus consists of shovel, rods, strike head and borer grip. For depths 0 to 30 / 30 to 60 / 60 to 90 cm.

Rubber sheathing and notch for removing samples can be attached to the borer grip. All individual parts are interchangeable.

Art. No.	
5100	**One-piece boring kit** With one grip for 0 to 30 cm boring depth. Weight: approx. 4.0 kg
5200	**Two-piece boring kit** With one grip for 0 to 30 / 30 to 60 cm boring depth. Weight: approx. 6.7 kg
5300	**Three-piece boring kit** With one grip for 0 to 30 / 30 to 60 / 60 to 90 cm boring depth. Weight: approx. 10.0 kg
	ACCESSORIES
5110	Shovel for 0 to 30 cm Inner ø 30 mm, outer ø 38 mm
5210	Shovel for 30 to 60 cm Inner ø 25 mm, outer ø 33 mm
5310	Shovel for 60 to 90 cm Inner ø 20 mm, outer ø 28 mm
5111	Rods for 0 to 30 cm ø 22 mm, length: 50 cm
5211	Rods for 30 to 60 cm ø 22 mm, length: 75 cm
5311	Rods for 60 to 90 cm ø 22 mm, length: 90 cm
5114	Strike head for all rods
5115	Borer grip for strike head ø 38 mm

SOIL SAMPLING AUGER CHAPTER 20

SOIL SAMPLING AUGER MADE FROM RUST-FREE STAINLESS STEEL

Two-part boring kit

Two-part boring kit for taking samples up to approx. 2 m. Includes Pürckhauer auger, extension, and borer grip with rubber sheathing and notch for removing soil samples.

Art. No.	
5500	**Two-part boring kit up to approx. 2 meters** approx. 6.7 kg
5501	**Pürckhauer with screw-on strike head** Total length: approx 1,165 mm, ø 22 mm
	ACCESSORIES
5311	Rods for 60 to 90 cm ø 22 mm, length: 90 cm
5115	Borer grip for strike head ø 38 mm

Spoon auger – stainless steel

Multi-part, extendable stainless steel spoon auger with a custom-shaped spoon tip. It is used for taking samples from rough materials such as compost, bark mulch or wood particles.

TECHNICAL SPECIFICATIONS:

Base unit:	Total length: 900 mm
	Boring penetration length: 300 mm
	outer ø Borer section: 88 mm
	inner ø Borer section: 8 mm
	Spoon slot in the insertion area: 70 mm
Extension:	Length: 650 mm
	Outer rod: 22 mm
	Inner rod: 16 mm

Art. No.	
5040	**Base unit**
5041	**Extension**

Stainless steel cross-section spade

Multi-part cross-section spade: used to examine grass sections on a golf course or sport field.

TECHNICAL SPECIFICATIONS:

Weight:	approx. 2.6 kg
	Rods + 2 spade halves
Length:	750 mm, spade 200 mm

Art. No.	
5900	**Stainless steel cross-section spade**

LAB CONFIGURATION

NANOCOLOR® 500 D and PF 12

1801

1850

Photometric nutrient analysis

The NANOCOLOR® 500 D and PF 12 digital photometers are the next innovative step for our photometric product line. These instruments can be used for any water or waste water analysis task and are perfectly suited to meet the present and future requirements of our customers. The NANOCOLOR can be used in industrial or municipal waste water management, drinking water supply, ground water, surface water, coolant water and boiler water systems, and soil analysis. The state-of-the-art illuminated graphic display is menu driven and capable of clearly displaying all key information (measured result, date/time, sample number, etc.). The display also shows when measurements do not lie within the specified measurement ranges. Measurements that exceed the measurement range can be queried in order to evaluate the dilution used.

TECHNICAL SPECIFICATIONS:

	PF 12
Type:	Microprocessor controlled filter photometer: auto-test and auto-calibration functions; wavelength range: 340 to 860 nm
Lens:	Automatic filter wheel with 7 interference filters Sensitive to ambient light: for quick measurements with uncovered cuvette shaft
Wavelengths:	345 / 436 / 470 / 540 / 585 / 620 / 690 nm plus one compartment for an additional filter
Precision:	±2 nm, half-width: 10 to 12 nm
Light source:	Tungsten lamp
Detector:	silicon photocell
Zero compensation:	automatic
Measuring modes:	more than 100 pre-programmed tests (NANOCOLOR® tube tests and VISOCOLOR® ECO tests), absorbance, transmission, factor, standard, 10 custom-programmable methods
Measurement range:	± 3 E
Accuracy:	± 1 %
Long-term stability:	< 0.002 E/h
Cuvette holder:	Round cuvettes with 16 mm outer diameter
Data storage capacity:	200 measured values, GLP-compliant
Display:	Illuminated graphic display, 64 x 128 pixels, All key data is available at a glance: Result displayed with dimension specification, date, time, sample number, sample location and dilution
Usage:	Intuitive menu navigation, membrane keypad
Interfaces:	USB 2.0
Update:	Free updates available via Internet/PC
Operating range:	0 to 50°C, up to 90% relative humidity
Power supply:	USB power adapter, batteries or rechargeable batteries
Housing:	Waterproof, IP67
Dimensions and weight:	215 / 100 / 65 mm, 0.7 kg

NANOCOLOR® 500 D

The auto-save function can be turned on and off in the configuration menu. Up to 3000 on-site measurements can be made using the heavy-duty integrated high-power battery with charge controller. The unit can also be continuously operated under 220/110 VAC. A battery-status icon is shown on the display. The photometer has a power-saver mode where it can be set to shut-off automatically when not used (for either 10, 20 or 120 minutes). The analysis routine is made simple and easy with the integrated laser scanner which is used for fully-automatic instant cuvette detection.

Round cuvettes (14-mm ID) and rectangular cuvettes (10, 20 and 50 mm) can be used without any adapters. One of ten languages can be selected in the configuration menu.

	NANOCOLOR® 500 D
Type:	beam filter photometer with microprocessor controller, auto-test and auto-calibration functions; Wavelength range: 340 to 860 nm
Lenses:	automatic filter wheel with 10 interference filters
Wavelengths:	345 / 365 / 436 / 470 / 520 / 540 / 585 / 620 / 690 / 800 nm plus 2 compartments for extra filters
Precision:	±2 nm, half-width 10 to 12 nm
Light source:	Wolfram-type point source lamp
Detector:	silicium photocell
Zero compensation:	automatic
Measuring modes:	over 100 pre-programmed tests, 99 user-programmable methods extinction, transmission, factor, kinetic, 2-point calibration
Measuring range:	approx. 3 E, unsigned
Accuracy	±1 %
Long-term stability:	<0.002 E/h
Cuvette compatibility:	round cuvettes, 14 mm ID, rectangular cuvettes, 10, 20, 50 mm
Data memory:	500 measurement records, GLP-compliant
Display:	graphical back-lit display, 64 x 128 point, 10 languages
Operation:	barcode system, menu-driven display, membrane keyboard
Ports:	USB 1.1 and bi-directional serial RS 232
Update:	via Internet / PC
Operating range:	0 to +50 °C, to 90 % rel. humidity
Power supply:	100 to 240 VAC, 50/60 Hz / 6 VDC, 3.2 Ah via built-in rechargeable battery with charge controller and power supply unit
Dimensions and weight:	227 x 282 x 105 mm, 2.4 kg

Art. No.	
1850	**NANOCOLOR® 500 D all-purpose photometer**
1801	**PF 12 all-purpose photometer**
	Including software CD, operations manual, dust cover, power supply unit, data cable, USB cable and calibration cuvette cell in a sturdy travel case.
	ACCESSORIES
1810	Nitrate NO_3-N, 0.3 to 22 mg/l 20 pcs. / package
1812	Ammonium NH_4-N, 1 to 40 mg/l 20 pcs. / package
1813	Phosphate P_2O_5, 10 to 50 mg/l 19 pcs. / package
1814	Potassium K, 2 to 50 mg/l 20 pcs. / package
1815	Magnesium Mg, 5 to 50 mg/l Calcium Ca, 10 to 100 mg/l 20 pcs. / package
1817	Iron Fe 0.1 to 3.0 mg/l 20 pcs. / package
1818	Copper Cu 0.1 to 7.0 mg/ 20 pcs. / package
1819	Zinc Zn, 0.1 to 4.0 mg 20 pcs. / package
1820	Molybdenum Mo 1.0 to 40 mg/l 20 pcs. / package
1821	Manganese Mn 0.1 to 10 mg/l 20 pcs. / package
1822	Chloride Cl, 0.5 to 50 mg/l 20 pcs. / package
1823	Sulphate SO_4 10 to 200 mg/l 20 pcs. / package
1851	Stand for 15 round cuvettes and 2 extraction vessels
1803	Digital cylinder-stroke pipette 0.2 to 1.0 ml, adjustable, with tip ejection mechanism
1804	Blue plastic tips for cylinder-stroke pipette no. 1860, 1803; 100 pcs.
1808	Digital cylinder-stroke pipette 1.0 to 5.0 ml, adjustable, with tip ejection mechanism
1809	Transparent plastic tips for cylinder-stroke pipette no. 1808; 100 pcs.
1860	Cylinder-stroke pipette, 0.2 to 1.0 ml, adjustable, with tip ejection mechanism

LAB CONFIGURATION

Thermoblock

Equipment for sample preparation

Programmable thermoblock for dissociative chemical analysis of samples. Easy to operate symbol buttons, pre-programmed standard programs for all routine extractions, and application-specific analysis methods. Also features high level of temperature stability and quick heat-up time. It is possible to analyse 12 round-cuvette samples (with 16 mm outer diameter) simultaneously.

TECHNICAL SPECIFICATIONS:

Display:	2 LED displays with 6-mm character height Temperature and residual display
Operations:	Membrane-covered symbol buttons with entry confirmation
Operating temperature:	+30 to +160 °C (in 1 °C intervals)
Temperatures:	5 pre-programmed temperatures 70 / 100 / 120 / 148 / 160 °C
Heat-up time:	From +20 to +160 °C within ten minutes
Heating intervals:	4 pre-programmed heating intervals Time range: 0:01 h to 99:59 h (in 0:01 h steps)
Safety features:	Interchangeable safety cover for touch protection, Integrated hood, Over-heating protection
Communication:	RS232 connection for NANOCOLOR® T Set (enables fully-automatic calibration and creation of a a testing certificate for test-equipment monitoring in compliance with DWA – A 704) Update with PC
Power supply:	110 to 230 VAC, 50/60 Hz
Power consumption:	125 / 250 VA
Dimensions and weight:	155 x 250 x 140 mm, approx. 1.8 kg

Art. No.	
1855	**Thermoblock with hood and power cable**
	ACCESSORIES
1856	NANOCOLOR® T Set for calibration and temperature control

UM 200 cabinet drier

Equipment for sample preparation

Housing made from burnished stainless steel. Interior made from rust-free acid-proof stainless steel. With natural ventilation and mechanical temperature control. Heats up very quickly. Designed to a high safety standard. Including timer from 0 to 24 hours and two stainless steel push-in plates.

TECHNICAL SPECIFICATIONS:

External dimensions:	550 x 600 x 400 mm
Internal dimensions:	400 x 320 x 250 mm
Volume:	32 litres
Operating temperature:	30 to 220 °C
Voltage:	220 V 1/N
Power:	1,100 kW
Weight:	29 kg

Art. No.	
6100	**Cabinet drier UM 200 with fully-isolated stainless steel door**

Labotherm LS muffle furnace

Equipment for sample preparation

Muffle furnace with stainless steel housing and high-quality insulation. Switching system in lower section of furnace featuring a user-friendly, dust-proof membrane keyboard. Separate ON/OFF switch. Precise programming in 1°C or 1 min. intervals. Adjustable increase in heat-up time.

TECHNICAL SPECIFICATIONS:

External dimensions:	400 x 530 x 450 mm
Internal dimensions:	200 x 130 x 180 mm
Max. temperature:	1100 °C
Voltage:	230 V 1/N
Power:	2.4 kW
Weight:	33 kg

Art. No.	
6200	**Muffle furnace including switch/control system with controller**
6201	**Flue with fan**
6202	**Ceramic collecting tray**

LAB CONFIGURATION

Strainer machine

Lab strainer machine and accessories

Strainer machine for the laboratory, for max. 16 analysis strainers, with 50-mm edge height, and up to 215 mm ø. Dry and wet sieving/straining are both possible. Stainless steel strainers in compliance with DIN ISO 3310/1, with 200 mm diameter and 50 mm edge height. Additional sizes are available on request.

Art. No.	
6080	**Lab strainer machine with universal clamping attachment**
	ACCESSORIES
6054	63 µm
6057	200 µm
6060	630 µm
6063	1.00 mm
6064	2.00 mm
6065	4.00 mm
6062	5.00 mm
6066	6.30 mm
6068	10.00 mm
6061	20.00 mm
6069	Strainer cover
6070	Collection base
6071	Intermediate base
6072	Intermediate ring
6073	Base with run-off
6074	Spare seal

LABORATORY ANALYSIS CHAPTER 21

LAB CONFIGURATION

Dewar vessel

Dewar vessel for determining the rotting degree

Dewar vessel made from silicoborate glass, silver plated, with metal sheathing. Enclosure made from zinc-plated iron sheet. Additional sizes are available on request.

TECHNICAL SPECIFICATIONS:

Temperature:	-196 to +600 °C
Capacity.	max. 1.5 l
Weight:	1.2 kg

Art. No.	
6095	**Dewar vessel**

Water purifier cartridge

Water purifier cartridge for non-pressurized desalinization

Plastic pressure-free desalinization cartridge: filled with regenerative ion-exchange resin material. Includes uptake pipe, Seran filter cloth, 1.5-m intake hose, 0.5-m outlet hose. Desalinized water is immediately available after water supply is connected. Additional sizes are available on request.

TECHNICAL SPECIFICATIONS:

External dimensions, in cm: H x ø:	48 x 16
Flow rate:	50 l/h
Capacity (10 °dGH):	440 l
Weight:	5 kg

Art. No.	
4031	**Desalinization cartridge**
4038	**Connection kit** Connection hoses, uptake pipe, flow-through electrode with EC meter
4042	**Regeneration**

Lab accessories and individual components

Art. No.	
2013	**100-ml beaker** with graduation marks
2044	**250-ml beaker** with graduation marks
2040	**1-litre beaker** with graduation marks
2043	**Powder funnel** ø 80 mm
2042	**Liquid funnel** ø 80 mm
0600	**1000-ml graduated cylinder** Clear PE glass with elongated shape
0580	**250-ml graduated cylinder** Clear PE glass with elongated shape
0570	**100-ml graduated cylinder** Clear PE glass with elongated shape
0560	**10-ml graduated cylinder** Clear PE glass with elongated shape

LAB CONFIGURATION

Scale

Manual pointer scale

Small easy-to-use scale with adjustable zero positioning.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 250 g
Resolution:	5 g
Tray:	132 x 115 x 53 mm, 700 ml
Housing:	Plastic
Dimensions and weight:	200 x 135x 110 mm, 280 g

Art. No.	
4060	**Manual scale**

Scale

Electronic precision scale

Electronic precision scale for pesticides, seeds, etc. Switch: On/off, automatic tare, automatic shutoff / zero position calibration system available.

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 500 g
Resolution:	0.1 g
Min. load:	0.1 g
Tray:	Plate: ø 65 mm
Power supply:	Four 1.5-V AAA batteries
Housing:	Plastic with tray
Dimensions and weight:	115 x 88 x 28 mm, 150 g

Art. No.	
4069	**Electronic precision scale**

Scale

Electronic precision scale

Electronic battery-operated precision scale for lab use.

Switch: On/off, automatic tare, automatic shutoff

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 500 g
Resolution:	0.1 g
Tray:	Plate: ø 120 mm
Power supply:	Two 1.5-V AAA batteries

Art. No.	
4066	**Precision scale** with calibration weight of 200 g

LABORATORY ANALYSIS CHAPTER 21

LAB CONFIGURATION

Scale

Electronic SOLAR scale

Solar-powered pesticide scale for the lab, with reserve solar energy function. Utilization: less than 150 lux

Switch: On/off, automatic tare, automatic shutoff / zero position. Min. load: 0.4 g

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 g
Resolution:	0.2 g (0 to 100 g) 1.0 g (100 to 2,000 g)
Tray:	Plate: ø 125 mm
Housing:	Plastic
Dimensions and weight:	196 x 125 x 65 mm, 410 g

Art. No.	
4062	**Electronic SOLAR scale**

Scale

Electronic scale

Electronic scale for pesticides
with stainless steel plate. Battery operated.

Switch: On/off, automatic tare, automatic shutoff

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 2,000 g
Resolution:	1.0 g
Weighing surface:	170 x 120 mm
Power supply:	One 3-Volt, CR2032 size battery
Dimensions and weight:	220 x 140 x 23 mm, 3 kg

Art. No.	
4067	**Electronic scale**

Scale

Electronic pesticide scale

Electronic precision scale for pesticides, with RS232 port, including adapter and batteries.
Switch: On/off, automatic tare

TECHNICAL SPECIFICATIONS:

Measurement range:	0 to 5,000 g
Resolution:	1.0 g
Weighing area:	185 x 185 mm
Power supply:	Six 9-Volt batteries, or mains connection
Weight:	3 kg

Art. No.	
4064	**Electronic pesticide scale**
4068	**Power supply unit**

CUSTOM-PRINTED MARKETING ITEMS

Double pocket magnifier

Double pocket plastic magnifier. Magnifies: 4-x or 8-x, Lens diameters: 34 mm with 2 lenses, 4-x/8-x.

Art. No.	
4400	**Double pocket magnifier**

Moisture tester

Moisture meter for your plants. The point indicates the soil moisture level. Operates without batteries. The long probe enables measurements deep in soil.

Art. No.	
8005	**Moisture tester**
8006	**Moisture tester** Box with 12 pcs. = unit price
8007	**Moisture tester** 10 boxes = 120 pcs. = unit price

Thirsty Light®

The digital Thirsty Light® provides a simple means for checking the soil moisture using a moisture meter with integrated Drypoint™ technology. The Thirsty Light® signals with an unobtrusive flashing light when the soil is too dry so that you see when water is required.

TECHNICAL SPECIFICATIONS:

Overall dimensions:	170 x 22 x 20 mm
Probe length:	105 mm
Power supply:	Two 1.5-V (AG13) batteries

Art. No.	
4209	**Thirsty Light®**
4290	**Thirsty Light®** Box with 12 pcs. = unit price

CUSTOM-PRINTED MARKETING ITEMS

Fertometer®

Checking the fertilization levels in potted plants

Easy-to-use meter for measuring fertilization in potted plants The nutrient component of the soil is shown by the multi-coloured LED readout and a fertilization suggestion is made at the same time. The Fertometer® delivers precisely measured readings and is housed in a rugged and durable case.

TECHNICAL SPECIFICATIONS:

Measurement precision:	< 3%
Display:	LED
Measuring technology:	EC (electrical conductivity)
Power supply:	One nine-volt battery, size 6LR61
Dimensions and weight:	270 x 50 x 35 mm; approx. 170 g

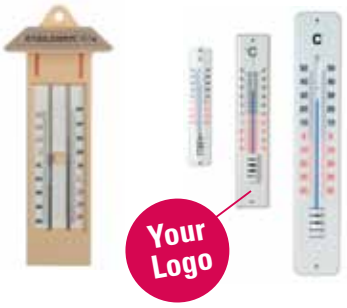
Art. No.	
8008	**Fertometer®**
8009	**Fertometer®** Box with 12 pcs. = unit price

Rain gauge

Plastic rain gauge with rain quantity scale in litres per m². Model with basket, pole fitting or rotary ring for keeping track of monthly rainfall levels.

Art. No.	
4011	**Rain gauge with pole fitting**
4203	**Rain gauge with rotating ring**
4204	**Rain gauge with basket**

Thermometer



Minimum/Maximum plastic thermometer with clearly readable scale. Measurement range: –38 to +50 °C. The metal gardener thermometer comes with an easy-to-read scale in a variety of sizes. Measurement range: –40 to +50 °C.

Art. No.	
4010	**Min/max Thermometer** 230 x 79 mm, 120 g
4019	**Gardener thermometer** 205 x 40 mm, 60 g
4059	**Gardener thermometer** 280 x 58 mm, 150 g
4017	**Gardener thermometer** 450 x 80 mm, 130 g

YOUR CUSTOMER NUMBER

D

PRONOVA Analysentechnik GmbH & Co. KG
STELZNER® product range
Bahnhofstraße 30
D-07639 Bad Klosterlausnitz, Germany

Bank account # 777 933 301
Deutsche Bank AG, routing # 100 700 24
IBAN: DE83100700240777933301
BIC/Swift: DEUTDEDBBER

VAT ID number: DE 194 694 256

Your billing address

Company
Name
Street address
Town, postal code
Telephone:
Fax
VAT tax number

Your delivery address (if different than billing address)

Company
Name
Street address
Town, postal code
Telephone:
Fax

Quantity	Art. No.	Product
		(Soil sample orders found on back side of form)
		Postage and handling *)

*) Within Germany, with max. size 1.20 m x 0.60 m x 0.60 m and max. weight 25 kg, max. 8.00 EUR. Request rates for international delivery or for larger dimensions/weights.

Date Signature

YOUR CUSTOMER NUMBER D

Please indicate which examinations you would like us to conduct for you.

Soil examinations	
☐ Nitrogen N_{min} (ammonium and nitrate)	☐ + Fertilizer recommendation
☐ Total nitrogen	
☐ Basic nutrient examination: pH, K, P, Mg	(including fertilization recommendation)
Topsoil / humus	
☐ One sample	
☐ 2 to 4 samples	
☐ 5 or more samples	
☐ Sulphur S_{min}	☐ + Fertilizer recommendation
☐ Clay content	
Heavy metals	
☐ Heavy metal extraction analysis	
☐ per element (not including mercury or arsenic)	
☐ Calcium	
☐ Salt content	
Compost examination	
☐ Small compost analysis – light soluble nutrients: nitrate-N, ammonium-N, P, K, Mg, pH, salt content, dimensional weight, water content, organic matter (loss due to burning/heating)	
☐ Mid-level compost analysis – similar to small compost analysis plus total plant nutrients: Kjeldahl nitrogen, P, K, Mg, Ca	
Fertilizer examination	
☐ Total content of N, P, K, organic matter, heavy metals and sulphur. Similar to soil examinations.	
Irrigation water examination	
☐ Nitrate	☐ Ammonium
☐ Phosphate	☐ Sulphate
☐ Calcium	☐ Sodium
☐ Magnesium	☐ Potassium
☐ Chloride	☐ Iron
☐ Total hardness	
Additional tests available on request.	

Normally, we can guarantee a processing time of one week or less upon receipt of your sample.
Slightly more time (but not more than two weeks) may be needed for special examinations (for example, heavy metals).

Date Signature

TEL ++49 (0)3 66 01/93 49 06 FAX ++49 (0)3 66 01/93 49 07 WWW.STELZNER.DE

Notes

Sijades© 01/14

Legal details

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